ADVERTISING PAGES REMOVED

A SERIOUS situation confronts the paper industry. It calls for an about-face in our planning for future operations.

The forests of the world are no longer available solely to the paper industry.

Science, chemistry and modern research have recently developd such a wide field for the use of wood pulp cellulose as the raw material base from which a vast variety of commodities can be made on lower cost and in many cases, better quality that the time has come to ask the pertinent question, "where is the wood pulp coming from?"

Before we go on to a brief résumé of the world's wood pulp situation, we direct your attention to what has happened to the cotton, wool and silk industries since wood pulp cellulose entered as a basic raw material.

In 1924, American production of rayon reached a total of 18,000 tons compared to a world production of 70,000 tons. In 1928, American production was 50,000 tons and in 1934, it reached 100,000 tons.

During the year, 1936, the United States production alone was 150,000 tons while the world's estimated consumption was 500,000 tons. The natural trend of increase established over the past twenty-five years indicates a total production of 3,000,000 tons at the end of a further ten-year period, a yearly average increase of 250,000 tons.

The tremendous increase in rayon production with its corresponding refinements in methods of manufacture *has reduced costs so materially* that rayon is taking the place of other fibers as the following figures clearly show:

	1920	1925	1930	1934
Rayon consumption was to—				
Cotton consumption as...	1:340	1:52	1:22	1:13
Wool consumption as....	1:30	5:9	3:7	5:6
Silk consumption as.....	1:3	8:9	3:2	3:1

"Woodman, Spare That Tree"

Every ton of wood cellulose used by this rapidly expanding rayon competition is a ton of wood pulp diverted from the paper consumer.

Another striking example of increased use of wood pulp cellulose is found in the paper box industry, which in 1926, produced 3,650,0000 tons of board and in 1937, 5,500,000 tons, an increase of 1,850,000 tons.

The diversion of wood pulp into manufacturing fields such as Cellophane, film, moulded plastic, not to overlook insulating, building and interior decorating materials is calling upon the pulp mill digesters for constantly increasing tonnage.

It is literally true that we are faced with an insatiable demand for our wood pulp cellulose. For that, we need have no concern. What should and must have our best attention is our wood and forest supply.

The United States, as a whole, has no forest conservation system worthy of the name. The owner of a block of timber, may cut it down and clear the land. Not so in Norway, Sweden, Finland, Germany and Canada. In those countries, although one owns the land and timber thereon, he may cut yearly only the increment growth thereon.

The paper industry requires 6.5 million cords of wood a year and the lumber industry, three times as much.

What is the nub of it all?

We are faced by a rapidly increasing demand for wood pulp products and rapidly diminishing supply of pulpwood.

What's the answer?

+ EDITORIAL +

Things Which Irritate

IN A LITTLE book entitled, *How to Handle Grievances*, a book written by Glenn Gardiner and recently published by Elliott Service Company of New York, is a wealth of information on a subject that more or less touches the life of every individual, for there probably is no one devoid of grievances of one form or another. Sometimes the grievances may be justifiable; in others, they are not; but, in any event, judicious handling of them is necessary if serenity is to prevail.

Keeping a working force happy is a job for any executive. In fact, the efficiency of an organization may be largely dependent upon how grievances, and probably most of them small, are handled.

It is the wisdom gained from years of experience in working with and in handling men that Mr. Gardiner has woven into his theme. His presentation is both direct and simple. Every executive would do well to read it.

So potent and fundamental is his partial list of conditions which give rise to worker dissatisfactions that the liberty is being taken of reproducing them with the hope that they may be of some help to some one. Here they are:

(1) Unexplained pay shortages. (2) Complicated wage payment systems. (3) Cutting of piece rates when "men run away with the rates". (4) Unguarded work hazards. (5) Giving orders without giving reasons. (6) Loss of earnings resulting from bad tools and machines out of order. (7) Favoritism. (8) Relatives working under a foreman. (9) Poor planning which interrupts and cuts earnings. (10) Unequal distribution of overtime. (11) Withholding credit. (12) Blaming workers unfairly. (13) Ignoring complaints. (14) Surly, hard-boiled or rough supervision. (15) Lack of human sympathetic interest in workers. (16) Bawling out workers before others. (17) Breaking promises. (18) Uncomfortable and unhealthy working conditions. (19) Unequal pay for equal service. (20) Lay-offs without notice. (21) Inadequate instructions leading to mistakes. (22) Use of threats. (23) Taking undue advantage of a worker's need for his job. (24) Stealing credit for a worker's ideas. (25) Ignoring or repelling suggestions. (26) Setting up too many rules and regulations. (27) Uncongenial fellow workers. (28) Putting men on jobs for which they are not fitted. (29) Penalizing workers for conditions beyond their control. (30) Failure to promote from within. (31) Inconsiderate methods of paying off on pay day. (32) "High-hat" foremanship.

Take a Lesson From Diamond Jim

MANNING, MAXWELL & MOORE, INC., Bridgeport, Conn., manufacturers of valves, gauges, safety valves and control instruments for industrial plants, recently announced a 25 per cent increase in its general field organization. The move is credited to the inspiration received from the career of Diamond Jim Brady. It will be recalled that he was the salesman par excellence at the turn of the century; that he started as a cub salesman selling railway supplies; that he began a program of sales spending during a panic in the 1890's when little if any spending was done by others; and that he ended up a multi-millionaire.

Bizarre as were the sales tactics of Diamond Jim, they most assuredly gave credence to the old adage—"Nothing ventured, nothing gained." Apparently, it is with such a point of view that the Manning, Maxwell & Moore organization took the initiative to increase its sales force at this time in spite of the general recession in business.

Many business executives may look upon such a move with askance; yet each of them realize the need for suitable merchandising effort and acknowledge the value of greater concentration in making sales contacts. It is simply the law of averages at work, the more salesmen, the more contacts; the more contacts, the more sales.

Surely such sales psychology well applies to the merchandising of many grades of paper and more sales effort right now might bolster up the 1938 volume of a number of paper mills.

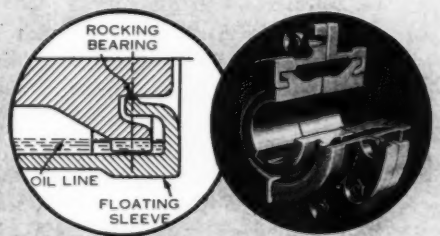
Profit from the experience of Diamond Jim. Do not wait for the storm of the business recession to blow over. Now is the time to sell. Make 1938 the biggest year in the history of your company.

THE SUPERIORITY

SHOWS UP IN PERFORMANCE

The Winner . . . away in a flash at the barrier . . . out in front and going strong at the half . . . showing his heels to the also-rans at the three-quarter . . . and romping home lengths ahead! He looks like the rest in the stable—but the superiority shows up in performance!

In couplings, too, the test of performance reveals the champion. Throughout industry—steel, petroleum, paper, power, etc.—the original and genuine Fast's Self-Aligning Coupling stands supreme, endlessly demonstrating the correctness of its principle and the quality of its construction and workmanship. Next time you buy machinery, specify "Fast's" and be sure . . . there is no "equal." Koppers Company, Bartlett Hayward Division . . . Baltimore, Maryland.



The illustrations show Fast's construction. The load-carrying surfaces are protected from wear by a positive film of oil. This oil is kept permanently clean by the rocking bearings which make precise metal-to-metal contact and are in the one position where they form permanent dust and moisture proof seals. These vital features are found only in genuine Fast's Self-Aligning Couplings.

FAST'S COUPLINGS

a KOPPERS product

We're Getting Along All Right

WILLIAM SIBLEY

AS THE "repression" rapidly takes the form and substance of another *de*pression . . . while the brass-collars of Big Business are flocking to the Nation's capitol with a general plea for more solid concrete in the Administration's planning . . . when most New Dealers are blaming Wall Street for deliberately causing the present business slump . . . with most of us fighting an inward fear of contract-cancellations, lay-offs and wage reductions, isn't it about time someone stood up and called attention to the multiplicity of silver linings which are in the plain sight of all who look at something besides the mud of life. We're getting along all right—in spite of wars and destruction, strikes and slumps, taxes and taxis, tumult and turmoil. Let's forget the Big Board for a couple of minutes and review just a few of the splendid things that happened in the year just passed.

If we did nothing more during 1937, sociologically speaking, than to make it fashionable to start a war on social diseases we could count that year a mighty mile-stone in the path of our progress. To forever kick over the deeply entrenched "Shhh-h-h-h-h" that has heretofore shrouded one of man's worst enemies and to bring into the glaring light of publicity the costliness, in money, life and happiness, of the beastly social diseases—is a noteworthy accomplishment.

But we did far more than that, in the field of medicine alone. Hospital standards advanced all along the line. We now have several medical centers established primarily for the aid of rural doctors. Birth control moved much closer to respectability. Radio went medical and is now extending its service to the remote parts of Alaska and Australia and to marine men at sea. We have gained new knowledge of methods to combat infantile paralysis, pneumonia, arthritis, hay fever, and measles. Cancer is much closer to a general exit. Deep sea divers, experimenting with helium gas, or a helium-mix, have vastly aided researchers in discovering a method for the cure and prevention of the common cold. Short-wave therapy has invaded new fields to the pronounced benefit of sufferers from fever. The universal understanding of the very important word "allergic" has, in itself, been of greater benefit to mankind than a general 10-point rise in the entire stock market.

Science, engineering and chemistry went on as usual, continuing to benefit mankind. One agriculturist banished all possible fear of food shortage because of overpopulation by proving that a tray of water, a pinch of chemical and some vegetable seeds is all that is necessary for plant growth. Gasoline may now be extracted from low-grade coal. The clumsy gear-shift lever is rapidly disappearing from trucks and automobiles. Welding has advanced to the point where it is now necessary to weld railroad rails together, not only for riding comfort but economy of maintenance. Last year scientists gave us an anti-skid floor wax; stop signs for pedestrians to carry; sound motion pictures of the operation of our internal organs; auto-horns which talk; greatly improved lights for fog-penetration; a cheap way for extracting still more iron from low-grade ore; wireless writing for airplane pilots and the microvivarium which exposed the private lives of the diatoms.

Much to the confusion and chagrin of the Freudians, psychologists now have traced the inferiority complex to the infant's thumb-sucking; and the lover-loving world got a whole series of heart-throbs out of the fact that, at long last, the Duke got his lady. While some professors blamed the sunspots for the confusion of the present, and others were placing the blame on our glands, the Soviets made several expeditions to the North Pole, a place where second-grade children insist "it is so cold the towns are uninhabited". We have been given a new cigarette holder, designed to hold a second cigarette as a smoke filter, thereby saving our lungs from the necessity of accumulating huge amounts of coal-tar and nicotine, and contributing materially to the business of cigarette manufacturers by literally wasting millions of cigarettes a month. One philanthropist gave a large country estate to a symphony orchestra; nearly three million fathers gave their daughters in happy marriage; while Braddock carried the battle to Farr. Diesel electric locomotives finally established themselves with the conservatism-bound railroads, and Mickey Mouse and the comic strips were adopted for school use.

Educators, too, evidenced ability to think and made long strides in the direction of improved methods of pedagogy. There was serious talk about teaching children how to live as well as what to know. They started their search for a means of training the emotions for personality's sake; of fostering and cultivating the sense of humor as a safe-guard against both superstition and propaganda; of making school-days more capable of adaption to the individual child and much less of the attitude: "Here is what you must learn whether you like it, or ever use it."

A final thing worthy of note in these headachy times is the fact that one scientist has now discovered a very simple, yet positively sure cure for headaches.

Yes—we're getting along all right.

ADVERTISING PAGES REMOVED

THE PAPER INDUSTRY
A MONTHLY EDUCATIONAL JOURNAL

Adhesive Properties of Lignin and Cellulose*

A. J. BAILEY

Abstract

The adhesive function of lignin and cellulose was studied by etching thin sections of dense fiber boards with suitable solvents. Removal of cellulose destroyed the structure while removal of lignin effected little change. Thin sections of paper containing high and low lignin contents behaved similarly, as did also the same sheets of paper. To verify that cellulose was responsible for adhesion, fiber boards were prepared from purified pulp by pressing at room temperature. The resulting boards had properties similar to the commercial product containing lignin. The relation of these findings to industrial processing is pointed out and changes, such as beating and chemical gelatinization, are recommended to increase strength.

THE adhesive potentialities of lignin have been the focus of extensive research in recent years. Much evidence appears to indicate that the binding and structural functions of lignin in wood are considerable. This evidence, coupled with the enormous waste of lignin [sawdust, pulping extracts, etc. (American sulphite mills alone waste in excess of 2,000,000 tons annually)] has stimulated research looking toward the development and utilization of adhesive properties of this second most abundant organic material. Many patents have been issued on claims for the utilization of lignin in an adhesive capacity while undoubtedly large sums have been spent on unreported research. In spite of exhaustive attempts to develop an adhesive from lignin, it can not be said that a single lignin preparation or derivative occupies a position of even minor importance in the general field of adhesives. This marked failure to develop adhesive properties raises the question as to whether or not adhesion, to a significant degree, resides in native lignin or its industrial or simple derivatives. To answer this question in a fundamental and positive manner seemed to be a worthy objective.

The Utilization of Ligno-Adhesion

Probably, the most extensive attempts to utilize the adhesive properties of technical lignin extracts have been as a road binder in Sweden, New Jersey, and Washington (*1, 2, 4, 9, 21*). Sulphite waste liquor has been considered for use as a cement for linoleum (*19*), as a binder for briquetting coal (*5, 13*), in ceramic bodies (*10, 14, 15*), for the improvement of textiles (*11*), as a source of glue (*16*), and in the preparation of synthetic resins (*17, 18*). Many other reports of similar researches appear in the bibliographical and abstract literature (*20*).

Processing in Board Production

The adhesive, thermo-plastic, and pressure-plastic properties of lignin are of distinct importance in the production of fiber boards and plastics from wood and similar materials. In view of the rapid expansion of

*Contribution from the Division of Forestry in co-operation with the Division of Agricultural Biochemistry, University of Minnesota. Released through the courtesy of the Director, Agricultural Experiment Station, University of Minnesota.

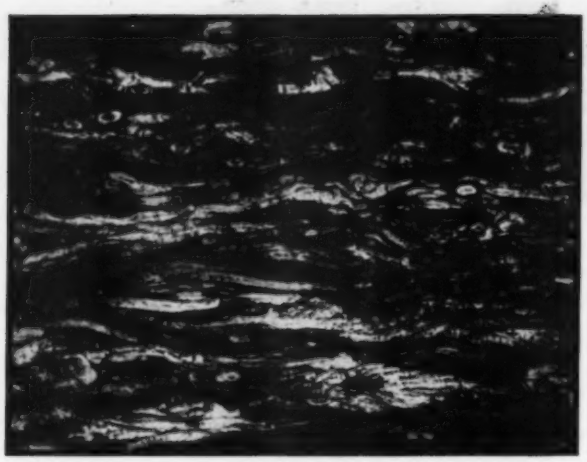


Fig. 1—Untreated thin section of fiber board, X 100

these industries and of the extension of knowledge essential to improvement in process and product, it would appear highly desirable to learn the real function of lignin in these materials. As a basis for discussion it may be said that commercial processes render the wood fibrous by exploding with steam or digesting in chemicals; each one subsequently employing a hammer-mill or other refiner. Representative of chemical processes, both as to treatment and product, is the method used by the Wood Conversion Company of Cloquet, Minnesota, which has courteously supplied details of processing. These details are outlined to define conditions of temperature, pressure, and chemical treatment in order to evaluate possible changes in the fibrous material which would be significant in the final product.

Chips are cooked in rotary digesters for two hours at 70 pounds steam pressure using 4 per cent of sodium sulphite (some processes use dilute alkali) per ton of pulp and enough water to cover the chips. After cooking, the chips are dumped and washed, then macerated in an attrition mill. After sizing with a wax emulsion, laps are formed on a fourdrinier machine or on a toggle press, run through press rolls, then dried in a plate dryer using 250 pounds of steam pressure in the first section and 150 pounds in the second section.

For hard boards, the pressure on the hydraulic press platens used by some manufacturers varies from 200-400 pounds per square inch usually with hot platens, producing a board having a specific gravity of 1.0-1.45+, a tensile strength of 4,000-6,000 pounds per square inch, and a modulus of rupture of 6,000-11,000 pounds per square inch. Under these processing conditions, thermo-plastic and pressure-plastic properties, if present, would be evident in the final product. It was therefore expected that a reasonably complete study of the adhesive functions of the various components could be made from studies of boards of this type.

Microchemical Studies of Sections

By means of suitable solvents, thin sections of wood may be treated in such a way as selectively to remove a single chemical component so that its location and function may be determined. For example, treatment of a transverse section of wood with a cellulose solvent leaves behind chiefly a network of lignin formerly in the middle lamella. The conclusion follows, then, that the secondary wall is principally cellulosic and the structural framework (if any) and adhesive function in the secondary wall was composed of and due chiefly to cellulose. Also, the network of residual middle lamella may correctly be regarded as non-cellulosic and as having a definite structural function. The opposite case of course, is the removal of the lignin as in oxidation of sections (*4*), leaving the more or less isolated and non-connected cells, usually consisting of only the secondary wall. Similarly, the conclusion follows that the middle lamella chiefly dissolves in lignin solvents while the secondary wall is principally non-ligneous, thus agreeing perfectly with the earlier conclusion formed from effects which existed in a sort of photographic positive and negative relation to each other. These conclusions are so well supported by other methods of investigation as to be generally accepted.

Etching of Board Sections

By analogy, the method offered promises of being a means of determining the structural and adhesive relations in a more complex material of the fiber board type.

Sections of boards had been prepared by Hooper (*12*) but no attempt was made to study adhesive forces nor did the poor quality of the sections throw light on structural functions. To study this phase, thin sections were prepared of "Tuff-Wood" (Wood Conversion Company), the sizing dissolved, and mounted for etching. An untreated section of this material is shown in Figure 1. Boards of this type are ⅛ inch in thickness, weigh 0.77 pounds per square foot, and have an average tensile strength of 5,750 pounds per square inch and an average modulus of rupture of 10,350 pounds per square inch. A section of this material was treated with sulphuric acid of 55-60 per cent concentration by dropping the acid on one side of the cover glass and drawing it through by means of blotting paper. By etching the section over a period of 6-8 hours and increasing the concentration of the sulphuric acid slowly, the cellulose was removed without swelling. Such a section with the major portion of the cellulose removed, is shown in Figure 2. Similar results were obtained by treating sections with cuprammonium solution varying the concentration in the same way.

Other sections were treated with phenol and hydrochloric acid (99:1) to remove the lignin. A section after delignifying is shown in Figure 3. Similar treatment with sodium hypochlorite yielded the same results.

Conclusions from Etching Studies

The effects of dissolving the two principal constituents appeared to be clear cut and in perfect agreement. The cellulose appeared to be responsible for most if not all of the adhesion, while the lignin appeared to contribute little to the adhesive forces and to function as a more or less inert filler. If these conclusions were correct, it seemed probable that a board made from lignin-free fiber should have equal or greater strength. Accordingly, an approach was planned along two lines of experimental procedure. First, two kinds of hand sheets were employed: one having a lignin content of

about 25 per cent, the other containing virtually no lignin; both furnishes coming from the same wood and subjected to the same kind of chemical treatment. Thin sections of the hand sheets were prepared and etched in the manner described above. In every case, treatment with a lignin solvent caused virtually no change in mechanical properties while partial removal of the cellulose caused disintegration. Portions of the same sheets about the size of postage stamps were then treated in watch glasses with these reagents, carefully washed and dried. Even partial removal of the cellulose made the sheets too fragile to be removed from the watch glasses while complete removal of the lignin reduced strength somewhat but, in general, yielded a sheet much like the original.

Following the second line of procedure, an unbleached sulphite coniferous pulp containing less than 0.1 per cent of lignin was suspended in water and filtered. The wet mass was placed between the platens of a hydraulic press and various pressures from 500-4,500 pounds per square inch were applied without any attempt to raise the temperature to accelerate drying. Moisture was removed by placing dry absorbent cauls next to the pulp, replacing them until no further moisture was removed, the entire process consuming perhaps one half hour. The newly formed board was then removed and allowed to dry to a condition in equilibrium with the atmosphere. While no quantitative tests were made, the boards appeared to have density and strength properties similar to commercial fiber boards. Inter-fiber adhesion seemed to be superior as the tendency to fray under mechanical abrasion was noticeably less. Boards having the same thickness as the commercial product seemed to be slightly stronger in both bending and tension or if somewhat thinner, to be about equal in these properties but requiring less weight to develop this strength.

To study the mechanism of the bonding process from a slightly different angle, fifty sheets of ordinary paper toweling were thoroughly wet with water and pressed under the same conditions outlined above. After a very few minutes of pressing, the individual sheets could still be peeled with moderate care. After 10-15 minutes it was impossible to separate the sheet and at the end of 30 minutes, a dense, hard board resulted similar to that obtained with the pulp suspension. Consequently, it appeared that fiber entanglement played only a minor role while an intimate position of cellulose interfaces concomitant with the removal of water caused adhesive effects.

Fig. 2—Thin section of fiber board after treatment with sulphuric acid. Most of the cellulose has been removed, X 100

Fig. 3—Thin section of fiber board after treatment with sodium hypochlorite. All of this material was soluble in 72 per cent sulphuric acid, X 100

Cause of Adhesion

From these observations it seemed clear-cut that the cellulose was chiefly responsible for adhesion, arising when the pulp was dried under pressure. Oddly enough, using pressures of 500 and 4,500 pounds, an increase of nine times, failed to show corresponding changes in the final product. The explanation would appear to lie in Campbell's theory of hydration as applied to papermaking (*6, 7, 8*). Accordingly, sufficient pressure must be applied to overcome frictional resistance and bring the cellulose micelles close enough together to permit the force of surface tension to operate when the water evaporates. This latter force, of the order of hundreds of atmospheres, would reduce the distance between micellar surfaces enough to allow crystallizing forces to hold the compressed structure together after the liquid evaporated.

If the above experiments were interpreted correctly, observations of industrial importance may be made. As Campbell pointed out (*7*), beating increases the external cellulose surface, hence, should be a major contributor to higher strength. It is further evident that gelatinization, whether by mechanical comminution or by mercerization, should have beneficial effects as demonstrated by a similar advance recently made by hydrolyzing the fibrous material before pressing (*3*), undoubtedly forming a dextrin having adhesive properties. Further, pressing at elevated temperatures would be expected to hydrolyze some cellulose and pentosans, furnishing additional adhesive material. The quantitative value of each of these sources of adhesion is, of course, unknown. However, it seems certain that the primary and chief source of adhesion may be attributed to cellulose.

In conclusion, beating or other means of gelatinizing cellulose would appear to merit special emphasis. In view of the above evidence that lignin functioned

largely, if not entirely, as a filler to break the strong cellulose to cellulose bond, claims for the polymerization (?) and bonding of lignin during processing, or for the benefits derived from the addition of mysterious chemicals, should be regarded reservedly. Finally, it would appear that the extensive knowledge of pressing, drying, calendering, and sizing of paper should apply with considerable force to board processing, since the adhesive forces appear to be of the same kind and source.

Acknowledgment

The author desires to express his gratitude to the Wood Conversion Company of Cloquet, Minnesota, for its courtesy in supplying processing data.

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Clays of Mississippi

MANY valuable clays have been listed in Mississippi as a result of a state-wide geological survey conducted co-operatively by the University of Mississippi and the Works Progress Administration. Known as the Mississippi Geological Survey, the project has been the means of gainful employment for a number of scientists and other persons of special skill who were taken from the relief rolls.

With the State of Mississippi having an abundant supply of various clays, the Mississippi Geological Survey, under the direction of Dr. William C. Morse, working in co-operation with the Chemistry Department and Geology Department of the University of Mississippi and the WPA, is not only conducting routine tests and investigations but beginning the study of a series of research problems that will lead to the economical utilization of native clays which should develop into incalculable wealth.

In virtually any part of the state where erosion has been uncontrolled, or streams and rivers have cut deep gorges, or cuts have been made in the construction of highways, out-croppings of many different kinds of clays may be seen. These clays vary in color from white through shades of yellow to brown; some a definite pink to deep reds and purplish reds; all admixtures of clays with different minerals.

Among the very valuable formations in the state are the bentonite clays. A study of the bentonite deposits and experimentation with their utilization has been made by Hugh McDonald Morse, formerly associate professor of geology at the University. Bentonite deposits were found in Prentiss, Monroe, Tippah, Itawamba, Rankin, Smith, Jasper and Wayne Counties.

Most paper manufacturers recognize the extraordinary advantages of bentonite for use as a filler. Long distance hauling and the high cost of the product have prevented wide use in this industry. The location of more paper mills in the South will doubtless prove a great stimulus to the development of the bentonite deposits, especially so in Smith, Jasper and Wayne Counties. For de-inking papers the practicability of its use has been proved. A mill operating at the rate of 40 tons of de-inked paper stock paper day made an average yearly saving of $15 per ton over the cost of using groundwood pulp.

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Expansion Test for Offset Papers

THE expansion and contraction of paper with changing moisture content is a serious problem with many users, particularly in multicolor offset lithography where slight expansion of the paper in process will cause serious loss. An important factor in control of the difficulty is the selection of paper with comparatively low hygrometric expansivity. A method of measuring the expansivity for a wide range of atmospheric humidities has been developed by Charles G. Weber and Martin N. V. Geib of the Bureau's paper section.

As described in the December number of the *Journal of Research* (RP1054), specimens of paper are mounted under tension in a cabinet in which humidity is controlled by salt solutions. Changes in length of the paper are measured by means of an optical lever, and the hygrometric conditions around the paper are determined with a wet- and dry-bulb hygrometer. The method has satisfactory precision, and the apparatus necessary is simple to construct and easy to operate. With it, the response of paper to a wide range of atmospheric conditions can be determined conveniently without air conditioning in the room and without tedious or difficult measurements. The device for making the test can be constructed in the average shop and operated in print shop, paper mill, or laboratory.

The new method was developed in connection with the study of lithographic papers. This investigation is being carried on at the Bureau with the cooperation and financial support of the Lithographic Technical Foundation, paper manufacturers, printing-equipment manufacturers, and air-conditioning engineers.

An Orifice Slide Rule

O. K. GRAEF

THE flow of water through orifices requires the use of an equation which is often used for the measurement of flow of small quantities of liquid, such as the flow through washer sprays, nozzles and machine spray pipes.

The formula for discharge is quite simple, being,

$$Q = A\,V$$

Q being the discharge in cubic feet per second,

A, the area of the orifice in square feet, and

V, the velocity of flow in feet per second.

This gives the theoretical flow from the orifice, but experience shows that the actual flow may be quite different, owing to the shape of the orifice, and the friction loss. Consequently a coefficient, *K*, must be added to the above to take care of these effects. Because the constant *K* is only constant for any single type of orifice, it cannot be enumerated unless the type of orifice is known. The formula taking this orifice constant into consideration, becomes,

$$Q = K\,A\,V$$

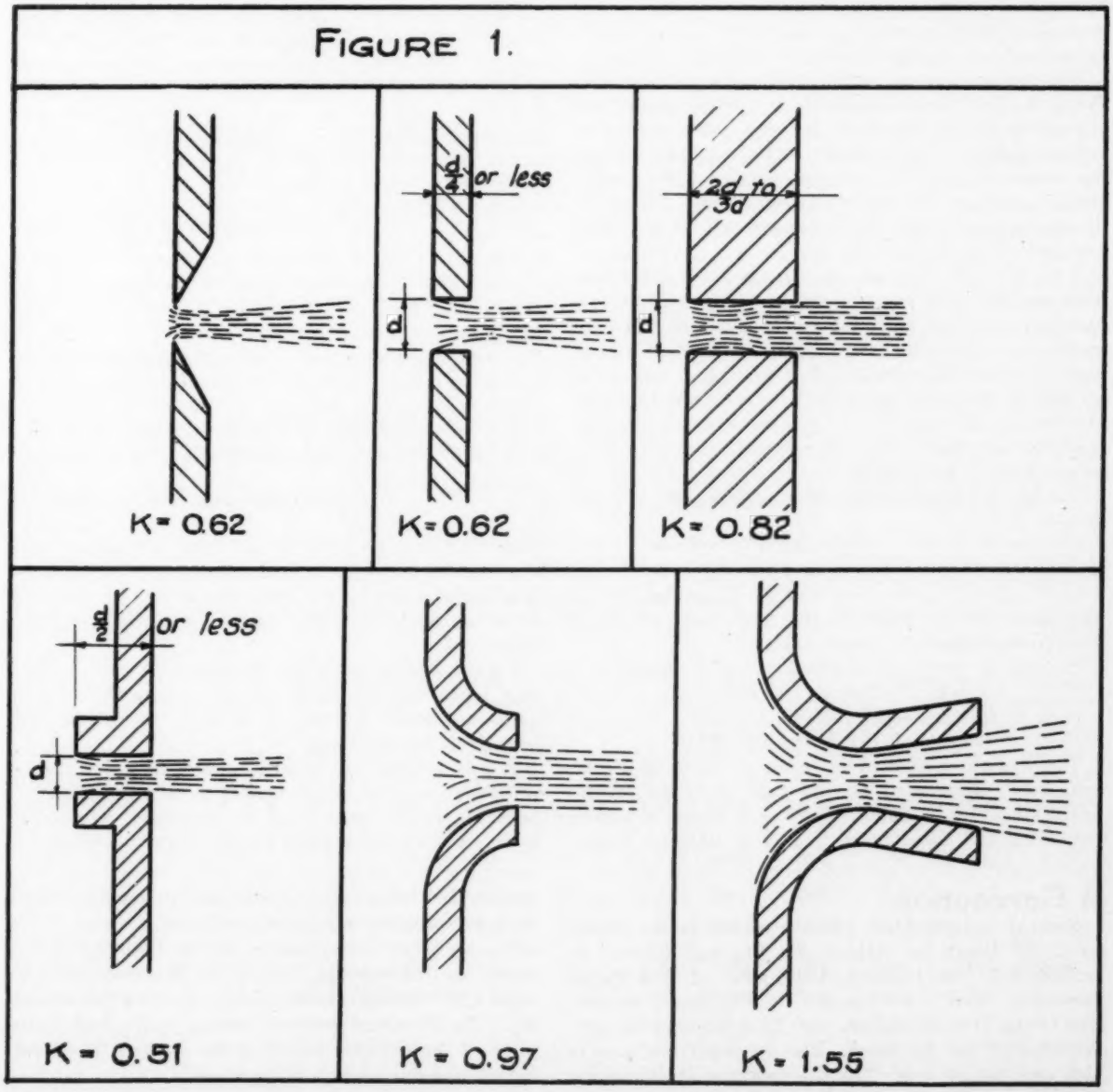
The velocity of flow is also equal to

$$V = \sqrt{2\,g\,h} = 8.02\,\sqrt{h}$$

g being the acceleration due to gravity, ft. per sec. and *h* is the head of water causing flow, in feet. Then substituting this for *V* in the foregoing, the formula becomes

$$Q = 8.02\,K\,A\,\sqrt{h}$$

FIGURE 1.



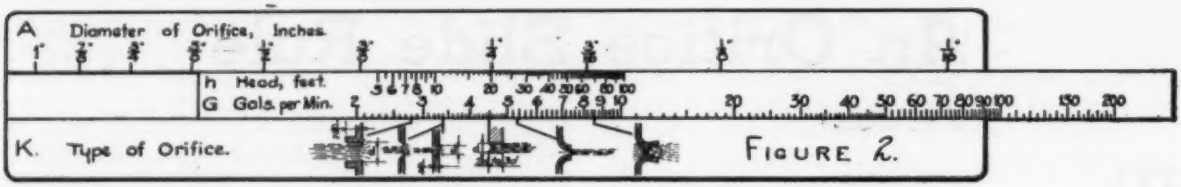


FIGURE 2.

It is preferable, when dealing with small quantities of water that the flow be expressed in gallons per minute, G, rather than in cubic feet per second. One cubic foot per second of flow is equivalent to 448.8 gallons per minute, and therefore,

$$G = 448.8 \times 8.02\ K\ A\ \sqrt{h}$$
$$= 3599.4\ K\ A\ \sqrt{h}$$

Re-arranging this in the standard form for slide rule plotting;

$$\text{Log } 3599.4 + \text{Log } A + \tfrac{1}{2} \text{Log } h - \text{Log } G + \text{Log } K = 0$$

Because the constant 3599.4 has only the effect of changing the position of the index on the slide rule, it may be eliminated from further consideration, and the rule plotted from;

$$\text{Log } A + \tfrac{1}{2} \text{Log } h - \text{Log } G + \text{Log } K = 0$$

The constant K, as stated before, varies with the shape of the orifice, and therefore must be given consideration if the rule is to be used with orifices of various shapes. For the more common orifice shapes, the values of K have been determined with considerable accuracy by many investigators. Figure 1 illustrates some of the more common orifices and their corresponding values of K.

Note that the formula as arranged for slide rule plotting has been re-arranged so that the function usually solved for, G, has been placed upon the slide rather than at the bottom of the rule stock. This has been done for the reason that only one scale will appear on the lower part of the stock, and this will allow plenty of space for the placing of small sketches identifying orifice types, for which the particular gauge mark is applicable.

The key for the direction of the scales, is

$\longleftarrow$ + Log A −
− ½ Log h + $\longrightarrow$
+ Log G − $\longrightarrow$
− Log K + $\longrightarrow$

The limits for the scales of the rule illustrated were decided as follows:

For the A scale, 1/16″ diameter to 1″ diameter.
h scale, 5 feet to 100 feet.
K scale, 0.51 to 1.55.
G scale, 2 G.P.M. to 200 G.P.M.

The A scale is plotted in terms of the area of the orifice but designated on the rule in terms of the orifice diameter in inches. Plotting in terms of square feet area, and designating in inches diameter means that a plotting table must be calculated to work from, as follows.

Dia. of orifice, inches.	Area of orifice, Sq. In.	Area of orifice, Sq. Ft.
1/16″	.00307	.0000214
1/8″	.01227	.0000852
3/16″	.02761	.000192
1/4″	.04909	.000341
3/8″	.1104	.000767
1/2″	.1963	.00136
5/8″	.3068	.00213
3/4″	.4418	.00307
7/8″	.6013	.00418
1″	.7854	.00545

The length of the scales to a modulus of 1″ will be:

A scale:
1″ × Log .00545 = 1″ × Log 3.7364 = 3.7364
1″ × Log .0000214 = 1″ × Log 5.3304 = 5.3304 = 2.406″

h scale:
1″ × Log 100 = 1″ × ½ Log 2.0000 = 1.0000
1″ × Log 5 = 1″ × ½ Log 0.6990 = 0.3495 = .6505″

K scale:
1″ × Log 1.55 = 1″ × Log 0.1903 = 0.1903
1″ × Log 0.51 = 1″ × Log 1.7076 = 0.2924 = .4827″

G scale:
1″ × Log 200 = 1″ × Log 2.2010 = 2.2010
1″ × Log 2 = 1″ × Log 0.2010 = 0.2010 = 2.4020″

The rule illustrated in Figure 2 is made on a 12½ inch blank and the modulus selected was

$$\frac{12.5''}{2.4''} = 5 \text{ approximately.}$$

Note that this modulus is used for all scales. The h scale, due to its fractional exponent is constructed to a modulus of 2½, but reflection will show that this is an apparent modulus rather than the true one which is 5.

Figure 2 illustrates the finished rule set to show that for a common beveled edge orifice, ¼ inch in diameter, under a head of 20 feet, 3.4 G.P.M. will issue from the opening.

If it is desired that other liquids than water also be calculated, it is a simple matter to add other indices based upon the viscosity of the new fluid, referred to water, and should present no difficulty.

A Correction

Several typographical errors occurred in the article by L. M. Booth on "Alum—Its Use and Effect" as published in the January, 1938, issue of THE PAPER INDUSTRY. One error appears in the twenty-seventh line of the first column on page 1164 through the substitution of *ten* for *tenth*. The corrected sentence in this case should read: In this instance *tenth* normal sodium hydroxide solution was used in amounts which were substantially equivalent to the alum used in the series. A second error occurs in the twenty-fifth line under the sub-heading, "Alum in Papermaking," on page 1165 through substituting *absorbing* for *adsorbing*. The corrected sentence should read: One is because of the selective action of the cellulose in *adsorbing* the alumina portion of the alum.

Degradation of Sulphate Fiber by Bleaching*

B. W. SCRIBNER

A YEAR ago the National Bureau of Standards in a news release called attention to the instability of "kraft" envelopes delivered to the National Government, which were composed of semi-bleached fibers, that is, fibers bleached only enough to lighten their color. On applying the accelerated aging test used at the Bureau, which consists in heating the paper at 100 deg. C. for 72 hours, such papers retained 6 per cent, or less, of their original folding endurance, as compared with a retention of 70 per cent or more for true kraft, unbleached sulphate. Based on experience with this test, a prediction was made that the paper composed of the semi-bleached fiber would deteriorate rapidly, and this has been confirmed by experience.

After storage for 1½ years, part of a lot of envelopes was found to be in such bad condition that it was unfit for use; the paper cracked apart when folded once. The rest of the lot was in excellent condition. All of the envelopes were stored together under identical conditions. The poor paper had the characteristic buff or manila color of semi-bleached kraft, and the good paper, the light-brown color of kraft; this difference in type of paper was confirmed by microscopic differentiation of the fibers. The poor paper had a pH of 3.9, a copper number of 7.4, and the alpha cellulose could not be determined because of its viscous nature caused by deterioration. These characteristics are all indicative of considerable degradation. The good paper had an average folding endurance of 4800 double folds (Schopper), a pH of 5.9, a copper number of 1.2, and an alpha cellulose content of 83 per cent; all indicative of very good quality. A similar experience was had with some of the Government Kraft Negative Preservers. These are envelopes used for photographic negatives which are to be stored over a long period.

Tests to determine the original properties of such papers revealed that the deterioration of the semi-bleached kraft paper is probably due to degraded cellulose, as shown by Table 1. In this table, test data are given for a typical kraft paper, and for several semi-bleached kraft papers having varying degrees of stability. The author interprets these data as revealing the following: The much greater instability of the latter papers results primarily from degraded cellulose, because they are all characterized by a lower alpha cellulose content and a much higher copper number than found in the kraft paper. The resin content is low in all cases, and even when the acidity is not high the semi-bleached kraft papers are unstable. Extensive studies of writing and book papers at the National Bureau of Standards have shown that acidity not above pH 5 is not harmful to paper; and three of the unstable papers had a higher pH than this, therefore, lower acidity. It is well known, however, that acid is a contributing factor in the deterioration of paper, therefore, higher acidity should be avoided.

The large differences in the beta cellulose contents of the unbleached and semi-bleached papers are of interest. They are so much greater than the differences

(*) Publication approved by the director of the National Bureau of Standards of the U. S. Department of Commerce.

TABLE 1

Test data for newly-made "kraft" papers

Fiber	Alpha cellulose (per cent)	Beta-cellulose (per cent)	Gamma-cellulose (per cent)	Copper number	Resin (per cent)	pH of extract	Folding endurance—Double Folds				Average retention (per cent)
							Unheated		Heated*		
							Machine direction	Cross direction	Machine direction	Cross direction	
Unbleached: No. 1138-1.....	84.2	0.0	15.8	1.3	0.8	6.2	9100	15000	7700	12000	81.7
Semi-bleached No. 1317-3.....	80.8	11.3	7.9	2.0	0.5	5.7	1200	1800	490	820	43.7
No. 1138-2.....	81.1	9.3	9.6	3.2	0.6	5.4	4300	2000	12	22	0.5
No. 1317-4.....	79.6	12.8	7.6	2.2	0.6	5.3	3700	1400	210	190	7.8
No. 1317-1.....	80.0	12.5	7.5	2.2	0.6	4.6	1700	580	None	None	None
No. 1317-2.....	78.8	13.0	8.2	2.5	0.6	4.6	4300	750	None	None	None

*Heated 72 hours at 100 deg. C.

TABLE 2

Data on relation between natural and accelerated aging of "kraft" envelope papers

SAMPLE	Folding endurance—Double Folds							
	Original		After heating 72 hours at 100 deg. C.			After storage for 5½ months		
	Machine direction	Cross direction	Machine direction	Cross direction	Average rentention (per cent)	Machine direction	Cross direction	Average retention (per cent)
No. 8168—kraft.....	9100	15000	7700	12000	81.7	6800	15000	90.1
No. 8134—Semi-bleached kraft	4300	2000	12	22	0.5	1400	1000	38.1

in alpha cellulose that possibly, for papers of this kind at least, they may be a more significant indication of fiber quality than the alpha cellulose.

The relative stability of papers having these characteristics is being further investigated by storing samples under natural conditions and testing them periodically to gain additional information on the rate of deterioration. One test, made after a storage of 5½ months, gave results as shown by Table 2.

This is further evidence of not only the rapid deterioration which semi-bleached kraft paper may undergo, but, together with the other data mentioned herein, of the validity of the heat test for judging the stability of paper.

It is known that very stable fully-bleached fibers of high strength can be produced by correct treatment of sulphate pulp. An example is contained in the Bureau Research Paper 949, *Study of the Effect of Fiber Components on the Stability of Book Papers.* One of the pulps listed, designated "purified wood pulp D," had good cellulosic characteristics, and a strong and stable paper was produced from it. The content of alpha cellulose was 84 per cent and the copper number, 0.72. One paper made from it had an average folding endurance of 2300 double folds and retained 87 per cent of this after heating. The details of the manufacture of this pulp are not known. Generally, however, in the production of the highest grades of wood fibers the usual cooking processes are modified, and the bleaching is done by the chlorine-caustic soda-calcium hypochlorite process.

It appears that the partial bleaching of sulphate pulp for envelope paper manufacture is confined more particularly to pulp produced from Southern pine wood. Inquiries addressed to several of the leading manufacturers of kraft envelope paper yielded the information that the bleaching of the pine pulp is necessary to obtain the near-manila color demanded by envelope manufacturers. The so-called "manila" envelope paper is generally composed of unbleached sulphite or a mixture of this with groundwood fibers, and it has largely been supplanted by kraft paper because of the much greater strength and stability of good kraft paper. It seems rather paradoxical that a good kraft fiber should sometimes be practically ruined in an attempt to imitate the appearance of paper of known inferiority.

True kraft paper, that is, unbleached sulphate, having an attractive light-brown color, is produced from Southern pine for wrapping purposes. The color is of sufficiently light shade for envelope use and if the envelope manufacturers and the consumers would regard such color as indicative of superior kraft quality, as contrasted with the manila color and corresponding quality, both would be materially benefited.

The presence of unstable so-called "kraft paper" in the market casts suspicion on the quality of any paper so designated. In fact, the Bureau has found some kraft wrapping paper to be composed of semi-bleached sulphate fibers and to have the same lack of stability as the envelope paper of this kind. Originally, the term "kraft" was applied to unbleached sulphate pulp only, and this definition is recognized in Federal Government specifications. Unfortunately, in the trade the term is often applied to papers containing modified kraft fibers, such as the semi-bleached fibers, and to mixtures of kraft fibers with inferior fibers produced by other pulping processes. This is one example of the harm that may be done by loosely-used paper terms, and of the benefit that might result from standardization of them by the paper industry. It is encouraging to know that a standardization of this kind is one of the projects of the Technical Committee of the American Paper and Pulp Association. It is obviously not sufficient at present to simply specify kraft paper if paper of good quality is desired. A simple remedy would be to require that the paper be composed entirely of unbleached sulphate fibers and to use light-brown kraft paper for the color standard. A limit for permissible acidity might also be desirable. The fiber requirement, however, might eliminate papers of good quality because, as mentioned, it is possible to bleach sulphate fibers without degrading them. Despite the time consumed in making the test, a preferable requirement would be that the paper retain its folding endurance satisfactorily on heating for 72 hours at 100 deg. C. Judging from the data at hand, it would appear that kraft paper of good quality should retain not less than 70 per cent of the average of the folding endurance in the two directions of the paper, on applying this accelerated aging test. A simple and comprehensive performance test of this kind is preferable to dependence on tests of the components of the paper, and the experiences with the natural aging cited show that it is valid for these types of papers.

Human Values in Business

FRED C. SMITH

SO often an organization is looked upon as being quite as inanimate as a piece of machinery or as imposing and permanent as our city skyscrapers. It's the John W. Smith Corp., or the First National Bank of Thomasville, or the Southern Light, Heat & Power Co. In many cases they have existed as long as we can remember, and in our minds they represent an impersonal something with an identity quite neuter in its gender.

While we freely admit that this peculiar viewpoint is tempered and modified in the minds of management because of its very definite appreciation of the many intimate problems of internal procedure; even there, the human equation is frequently viewed by management in so detached a light that much of the potential worth of the individual employee is lost sight of in the shuffle.

A business—any business—is in its final analysis made up of specific, living, human beings. Their characters, qualifications, inhibitions, background, adaptability, perseverance, vision and ambitions combine to determine just how far that company will go.

For instance, the average man on the street has always thought of a bank as being the logical and safe place in which to keep his money. Ever since childhood days, the idea of safety and security has been symbolized by that magic word *bank;* and in order to further engender that belief, we have encouraged the development of impressive structures and expensive trimmings that would represent to the average mind solidity and security.

Yet those physical externals do not, necessarily, have any relation whatsoever to the actuality of safety that exists in the minds of depositors or prospective depositors. In reality, the bank, together with the element of safety, is nothing more than the human elements—very human elements—made up of the bank president, his immediate lieutenants and his board of directors. Only insofar as their knowledge of banking, investments, finance, markets and good business sense is sound—is that bank safe and the depositors' money secure.

Again, we have seen large, long established organizations go into dry rot and gradually pass into obscurity or total extinction. In practically all such cases we have found woven into the fabric of those companies' histories the story of human values that have lacked the required foresight, progressiveness, and business sagacity to keep the company in step with the times and develop within the business body itself a sufficient strength and virility to carry it through the peculiar difficulties that confronted it.

No, a business institution is not an impersonal something. Rather is it a real, live, pulsating, animated identity that exists and functions healthily only in proportion to the robustness and complete development of the human values making up its entirety. The cumulative power of those factors or human values traced from the office boy straight up to the operating head spell either success, mediocrity or failure.

But, how many members of management know—in sufficient detail—just what human elements and values are tied up in their business? Of course they know how many men and women are on the payroll, and that George is head of that department, Bill head of that division, or that Miss Brown is handling such and such an activity. Also in a superficial manner they may know some of the people making up the rank and file of the various departments. But except in rare cases management does not feel compelled to go any farther, and such an attitude expresses a philosophy that is hurting thousands of organizations in every activity of business.

Let's go a step further and consider Bill, George and Miss Brown as representing the department heads. How well does management know these key people? Actually know them and understand them? Has management invited confidences? Has it tried to get sufficiently close to them to ascertain their ambitions and their depth of knowledge of the business? Or has the cloak of dignity and consicousness of position so enshrouded management that these men and women are excluded from the sanctity of a supposedly rarified atmosphere? Or George, Bill and Miss Brown simply taken for granted and their work and efforts accepted with studied impersonality, except, of course, when something goes wrong?

Those are probing questions that go far beyond any sentimental or humanitarian horizon. They dig down deep into the vitals of practical business operation, and have a determining influence on earned profits and the successful expansion, yes, the very existence of an organization.

Let's take still another step and inquire as to the completeness of management's knowledge of the actual functioning of the various departments or divisions of the company. Does management confine itself to a purely supervisory attitude, seeing and knowing only results without knowing how those results are accomplished? Are George, Bill and Miss Brown so left to their own devices that they do pretty much as they please without having to account to any centralized authority?

We know from actual experience and observation that the lack of such finite centralized control does exist in myriads of concerns and that it operates to the detriment of the earning power of the company.

At no time should it be the purpose of management to enforce a censorship or supervision over department heads so strict and hide bound as to smother or cripple initiative. But on the other hand, management should be so alive to the requirements of each department, so thoroughly and intimately acquainted with the routine and objectives of each department, that there would automatically be nipped in the bud any duplicating or unnecessary moves that would run up overhead.

Such an awareness on the part of management

would also eliminate much of the pettiness and selfish individualism, internal politics, etc., that so often tinctures and warps the operations of departments that do not enjoy the close supervision of a wide awake, broadminded up-to-the-minute management.

You say it has always been an accepted practice not to interfere with department heads in the running of their departments. I agree. But it is submitted that we are in the midst of great changes. Changing standards, changing requirements, new problems, new concepts—so that what was good enough in the old days is not, necessarily, good enough today.

Under this new set-up, management should *know* accurately, completely and in exhaustive detail, just what is going on in every phase and department of its business; and that thought swings us smoothly and naturally into the realm of control and practical business discipline.

The contingencies of this present business era compel us to be more acutely aware of what we are doing, where, how and why we are going—it is too expensive to guess. We have got to be better thinkers and planners than ever before. We've got to know more profoundly our problem, in all its ramifications and implications.

And one phase of that problem is represented by those human values we've been talking about—values that must be controlled and developed and held at all times under an enlightened and constructive discipline.

To me, the highest and most effective expression of discipline is not found, necessarily, in an arbitrary set of rules that try to govern an employee's actions and behavior. Neither is it represented by a type of supervision that so often is deliberately planned to irk and tear down the orderly thinking processes of the employee.

True discipline in spirit and in practice is a firm, just and constructive *control* of the employee that is grounded:

(1) In a thorough and practical knowledge of the employee's work and the requirements of his job.

(2) In a knowledge of the peculiar characteristics and temperament of the employee.

It is a definite influence of creative value that tends to strengthen and build up the employee into an organization factor of greater effectiveness and productivity.

At the same time, such a type of discipline would have little or no use for the man or woman who lacked either the ability or inclination to *grow*. Such an employee would be discarded with utter impersonality as quickly as such a condition was definitely found to exist.

The foregoing concept of discipline, if sedulously practiced, would mean much to the individual and to the company.

From a purely humanitarian standpoint, the author does not believe management's obligation to the employee ends with the pay check. Rather is it management's job to develop him, if possible, and help him to grow into a more effective factor of the business, thus permitting him to increase his earning power. But, from a purely organization standpoint, management owes it to the company to see that the fullest possible degree of creative work is produced by that man. But you can't do that (be he rank and file or department head) by leaving him alone on the theory that it's all up to him now he's on the payroll. Neither can you do it by subjecting him to a type of supervision or discipline that fails to bring out the best in him.

He must be controlled—led. He must be encouraged, inspired and strengthened; and above all else he has to be given the fullest possible opportunity to grow and produce—to the utmost—under the right influences.

We read that "as a man thinketh in his heart so he is" and in very truth we find that to the degree to which you understand and control the human values in your business, so shall you prosper. Those values are the vitals of your business. They are the living elements, the internal organisms of the business body that, if brought to the proper degree of development, strength and productivity will surge your business forward along exceedingly profitable and worthwhile lines.

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Glycerine as a Useful Laboratory Aid

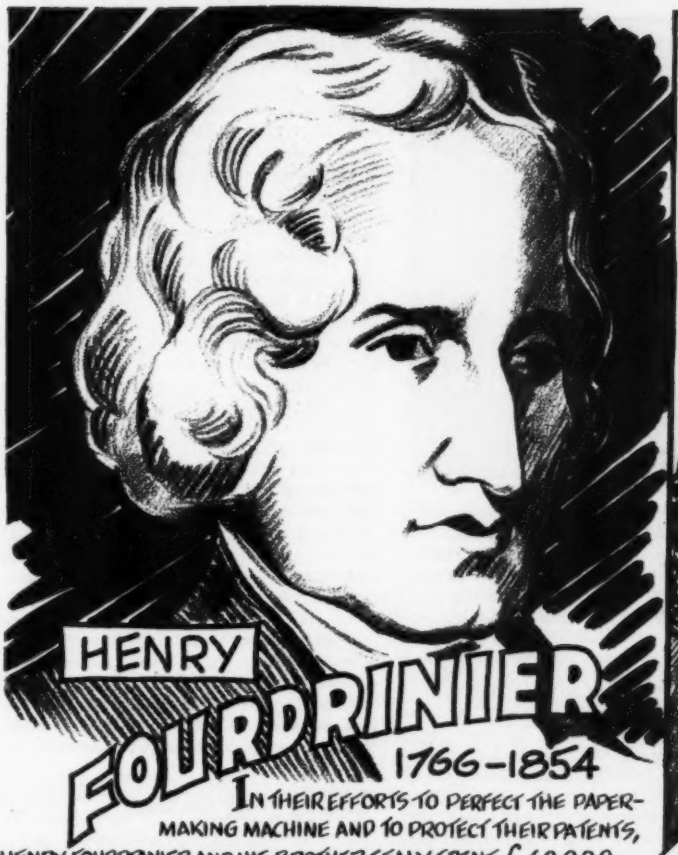
EVERY plant chemist knows glycerine to some extent but not everyone realizes its wide diversity of helpful practical application in the laboratory. If glass-stoppered bottles have "frozen", for example, place a few drops of a mixture of equal parts of glycerine and water on the lip of the bottle so the solution can seep down between the glass stopper and bottle neck. The glass stopper will, as a rule, come out easily. If it does not, try warming the glycerine solution before another attempt.

Similarly, frozen glass stop-cocks on burettes and separatory funnels may be separated. Those ground glass connections and joints on the newer interchangeable types of apparatus are not immune to the tendency to lock together. The glycerine solution will help here, too.

Rubber tubing and sheeting will not crack or crumble so readily if coated with a thin film of glycerine to prevent excess drying and help keep the rubber soft and resilient. When making rubber connections to glass or to outlets for steam, air or gas, the use of glycerine as lubricant will make the job of connecting easier, especially with heavy walled pressure tubing. Try glycerine, too, as a lubricant for ether extraction equipment and for stop-cocks and glass closures when used in the presence of ether, benzine, chloroform or the like.

Solutions and other preparations containing gelatine, glue or gums will not dry out if glycerine is added. Because of its hygroscopic nature, glycerine has the power of attracting and retaining moisture, a characteristic which it contributes to every mixture of which it is an ingredient. Because of its high boiling point, the glycerine will not evaporate in any extremes of climate. Glycerine, too, has a definite preservative action, and so aids in the prevention of mould growths. (Courtesy *Glycerine Producers' Association.*)

Paper Sketches ---



HENRY FOURDRINIER 1766-1854

IN THEIR EFFORTS TO PERFECT THE PAPER-MAKING MACHINE AND TO PROTECT THEIR PATENTS, HENRY FOURDRINIER AND HIS BROTHER, SEALY, SPENT £60,000, WENT BANKRUPT, AND SPENT MOST OF THE REST OF THEIR DAYS IN COMPARATIVE POVERTY. HENRY, WHO OUTLIVED HIS BROTHER, WAS SUPPORTED LATE IN LIFE BY A SMALL GRANT FROM PARLIAMENT AND BY A SUBSCRIPTION TAKEN UP BY ENGLISH PAPER-MAKING COMPANIES. AT THE TIME HE BECAME IDENTIFIED WITH THE PAPER MACHINE (ABOUT 1801) FOURDRINIER WAS A WELL-TO-DO PAPERMAKER.

THE FIRST PAPER MONEY EVER ISSUED IN THE BRITISH EMPIRE WAS THAT PRINTED IN THE 1690's BY MASSACHUSETTS TO PAY OFF COLONIAL SOLDIERS AND SAILORS WHO MADE AN EXPEDITION TO QUEBEC AGAINST THE FRENCH. . . . .

SEVERAL LARGE AMERICAN NEWSPAPERS PRINT A LIMITED NUMBER OF EACH EDITION ON RAG PAPER FOR THE MORE PERMANENT RECORDING OF NEWS OF THE DAY.

A LIGHTWEIGHT FELT-LINED PAPERBOARD PRODUCT WAS USED BY PROSPECTORS DURING THE ALASKAN GOLD RUSH OF 1897 FOR CABIN CONSTRUCTION.

Application Engineering Development

RECENT developments and advances in knowledge of lightning protection, power distribution and lighting have been epitomized by P. L. Alger, of the General Electric Company, in "Progress in Engineering Knowledge During 1937." The resumé follows:

Lightning Protection

A comprehensive review of the accumulated knowledge of lightning phenomena, and the fundamentals of lightning protection, has been prepared *(1, 2)* The remarkable progress made in this field in recent years, and the ever-increasing specialization accompanying it, make it convenient to divide the subject into six distinct branches.

Using complete laboratory equipment mounted in a truck, including a modified Dufour oscillograph, and an improved form of initiating circuit, controlled-voltage surges have been applied to many actual power circuits. Oscillograph records of these tests have determined the transmission, attenuation, and reflection characteristics of lightning wave shapes, while new ways of accurately defining surge voltage wave shapes in terms of circuit constants have been described. *(3, 4)*

The flashover voltages and impulse strengths of bushings, gaps, arresters, and

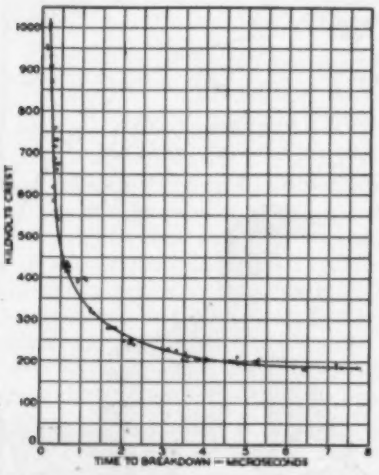


Fig. 1—Volt-time curve of a 10-in. rod gap: ½-in. square rods
● 2000 ohms series resistance
✚ 1500 ohms series resistance
× 0 ohms series resistance
1.5×40-microsecond wave for tests with 2000 ohms series resistance, positive polarity

of high-voltage insulating materials and structures have been determined by many laboratory and field tests. *(5)* New data have been obtained on the sparkover values for time intervals between 0.4 and

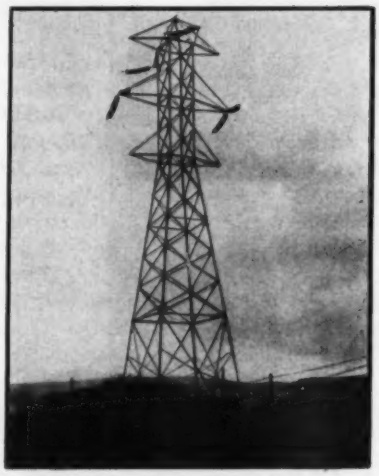


Fig. 2—Standard transmission-line tower used for studies of ground resistance, ground wire, counterpoises, magnetic links, etc., in connection with the General Electric High Voltage Engineering Laboratory at Pittsfield (Mass.)

2 microseconds particularly (Figure 1), and improved equipment for making the accurate measurements involved has been described. *(6)*

The design of line insulation, ground wires, tower footings, and counterpoises, and their effects on surge-voltage stress distribution throughout the power system, have been studied both theoretically and experimentally, and the essential factors have been arranged for convenient use in chart form. *(7, 8)* Figure 2 illustrates one of the transmission-line towers insulated to withstand 1,500,000-volt surges, built especially for these tests. The growing importance of Petersen coils as an economical and reliable method of protection is evident from recent application surveys. *(9)* Suitable overhead ground wires, and low tower-footing resistance, which keep the tower potential below the conductors, will usually prevent phase-to-phase faults, while single-phase faults will be effectively extinguished by Petersen-coil operation. Measurements of tower-footing and counterpoise currents on many transmission lines have contributed to a knowledge of economic balance between the different protective elements under different field conditions. *(10)*

Expulsion gaps, designed to prevent line flashovers by the controlled discharge of voltage surges, have been the subject of especial study, extensive field tests being made to establish their impulse-discharge characteristics, voltage recovery rates, and maximum interrupting capacities. *(11)* Figure 3 shows the operation of these gaps during a staged three-phase test on a 26.4-kv system with a 75-ohm neutral ground.

The protection of station apparatus against incoming lighting surges, by use of lightning arresters, capacitors, gaps, and other means, has also been carefully investigated. Figure 4 for example, gives a convenient means of determining the protection afforded by a Thyrite lightning arrester located at any desired distance from the protected apparatus. *(12)*

Co-ordination of insulation levels for line, bushings, and gaps with the impulse strength of transformer windings has been carefully planned to afford the maximum economic degree of protection. *(13, 14)* It is now possible to obtain transformers with a demonstrated impulse strength, and to provide means that will keep service stresses definitely below this strength.

In each of these six aspects of lightning protection, the great store of available knowledge has been brought together in convenient form for use by designers and operators, and fresh ideas have been injected, making possible more reliable electric service now and still more reliable service in the future.

High-voltage transients, many times normal voltage, have been discovered to sometimes accompany the operation of load-ratio-control contactors on power transformers. Ordinary circuit-breaker theory assumes the current is always in-

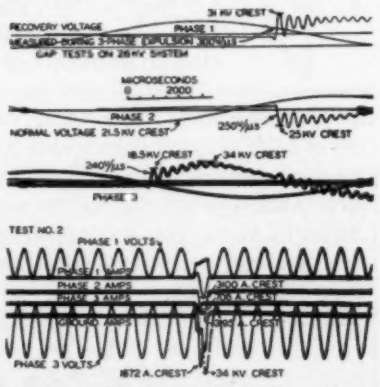


Fig. 3—Oscillograms taken with a three-element cathode-ray oscillograph and automatic magnetic oscillograph during staged tests on expulsion-protective gap for a 26.4-kv. system

terrupted at the current zero, so that there is no stored magnetic energy in the circuit, and the only voltage transient is that due to the capacitance voltage at the instant of cut-off. It has recently been found, however, that a contactor may interrupt a low value of current abruptly some 10 deg. from the current zero. The stored energy in the series reactance is considerable at this point, giving rise to a high-frequency voltage

transient of large amount, often causing several successive restrikes of the arc before the circuit is finally cleared. A full understanding of these phenomena was obtained by oscillographic tests and

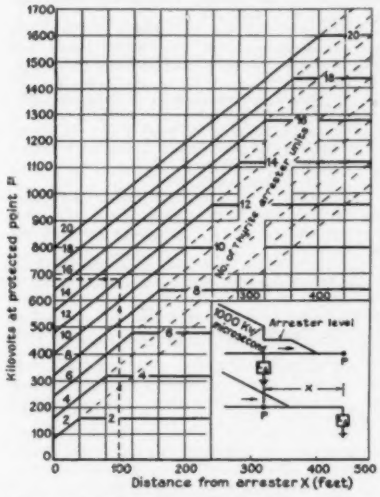


Fig. 4—Protection afforded by arresters at different distances

(These curves are based on a traveling wave of 1000 kv. per microsecond, an arrester voltage of 40 kv. per unit, and a zero capacitance at P.)

(Example: Twelve Thyrite arrester units will hold 680 kv. 100 ft. away and 480 kv. at the arrester.)

(a): Solid curves are used for an arrester on the line side of a protected point.

(b): Dash prolongations are used for arresters on the far side of the protected point.

theoretical analysis, and it has been found possible to limit the overvoltage to any desired degree by use of a shunt resistor, preferably of Thyrite. *(15)*

Power Distribution

An exhaustive study of the application of series capacitors for the compensation of line-drop, or improved voltage regulation, in power circuits, has demonstrated their great value for this purpose. *(16)* However, three distinct sources of operating difficulty were revealed which must be guarded against. Distorted and excessively large transformer exciting currents may occur, because of ferro-resonance. The high inrush current displaced from zero, owing to saturation caused by superposition of the a-c flux wave on the residual flux, sets up a charge on the capacitor whose discharge in turn creates current offset in the other direction, thereby causing a persistent low-frequency oscillation. Hunting of synchronous machines, and self-excitation of either synchronous or induction machines may also be set up by series capacitors. A remedy for the self-excitation phenomenon has been found in use of a high resistance shunting the series capacitor. Further, the analysis enables the proper capacitor and its location to be chosen so as to minimize hunting in the case of synchronous machines. This new information will permit a considerable extension of series-capacitor applications.

Practical methods of bettering short-circuit protection on 2300-volt and higher-voltage motor applications have been proposed, including the use of oil fuse cutouts as back-up protection, and of reactors to reduce the capacity of circuit breakers or contactors required. Figure 5 illustrates the effective co-ordination of the fuse and overload-relay protection against fault currents of different magnitudes and durations. *(17)*

Methods for calculating short-circuit currents in a-c network distribution systems have been improved and simplified, with the aid of new tabulations of system constants, and formulas to cover all types of power circuits. *(18, 19)*

The behavior of various forms of protective relays under abnormal operating conditions has been analyzed, giving a better insight into the apparent vagaries of relay operation. *(20)* The chief difficulty experienced with relays is their occasional operation at the wrong time, due to the relay's mistaking a system oscillation for an actual short circuit. These false operations can be minimized by special adjustments to fit the particular relay location, and by time delay and quick resetting, but they can be completely avoided by use of a wired-pilot or carrier-current system.

Very-high-speed reclosing circuit breakers, which enable power service to be restored after a flashover without shutting down synchronous machinery, have been described and operating results reported also. *(21)* The close co-ordination of the current-time characteristics of the several protective devices on power circuits that is necessary nowadays is indicated in Figure 6. Improved

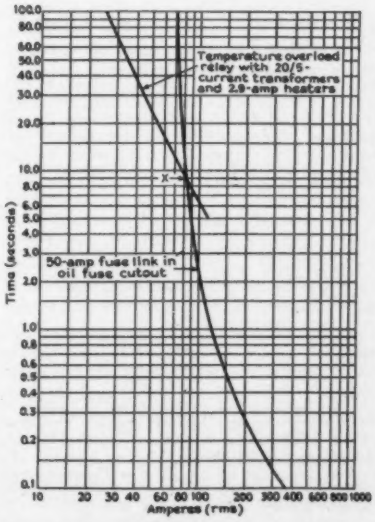

Temperature overload relay with 20/5-current transformers and 2.9-amp heaters
50-amp fuse link in oil fuse cutout
Time (seconds)
Amperes (rms)

Fig. 5—Combination oil fuse cutout and relay protection for high-voltage motors

Curves show relation of relay on contactor and fuse-link time-current characteristics for proper co-ordination in protecting 40-hp. 2300-volt motor. Relay opens all currents up to point X (where curves cross), then fuse clears the circuit.

forms of fuses and cutouts for distribution systems have been found increasingly useful in this field. *(22)*

Data have been presented on the initial current values when incandescent

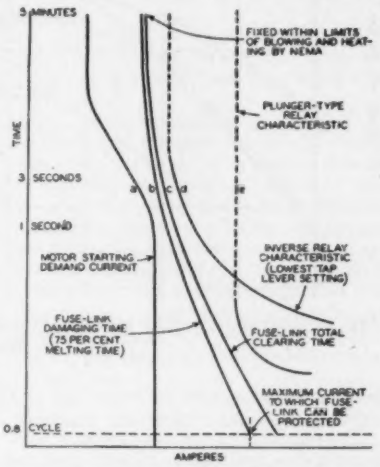

MINUTES
TIME
3 SECONDS
1 SECOND
0.8 CYCLE
FIXED WITHIN LIMITS OF BLOWING AND HEATING BY NEMA
PLUNGER-TYPE RELAY CHARACTERISTIC
MOTOR STARTING DEMAND CURRENT
INVERSE RELAY CHARACTERISTIC (LOWEST TAP LEVER SETTING)
FUSE-LINK DAMAGING TIME (75 PER CENT MELTING TIME)
FUSE-LINK TOTAL CLEARING TIME
MAXIMUM CURRENT TO WHICH FUSE-LINK CAN BE PROTECTED
AMPERES

Fig. 6—Curves showing scientific development of universal cable-type fuse links

lamps are connected to a circuit. The cold resistance of the filament in a standard gas-filled 100-watt lamp is only one fifteenth of its value when hot so that, under average lighting-circuit conditions, the current will initially rise to eleven times normal. This overshooting of current does no harm, as it dies down to normal value in only one tenth of a second, but it makes it necessary to set quick-acting circuit breakers for two or two-and-a-half times normal lighting load to avoid false operation. *(23)*

The complexity of modern metering requirements is rapidly increasing, as combined power and lighting circuits are more generally used, with special rates for maximum demand and off-peak power, creating a need for totalizing demands on separately metered circuits. The progress of this art, and the latest advances in contact devices, totalizing relays, watthour-demand meters, etc., have recently been described. *(24)* Five types of telemeters, to provide readings of quantities that are remote from the point of measurement, are now used for control of tie-line loads, automatic-station operation, and a variety of non-electrical measurements also. (25)

Lighting

A new book that correlates the results and analyses of the extensive researches of the Lighting Research Laboratory has just been published. *(26)* This book is a scientific contribution that will be a real force in the development of more effective, more comfortable, and safer lighting practices. It was written chiefly from the standpoint of the new concepts and knowledge of seeing, and the considerations deal largely with controlled factors which can contribute toward quick, certain, and easy seeing. A bulletin on illumination design has also been prepared, giving in convenient reference form data on new light sources, new re-

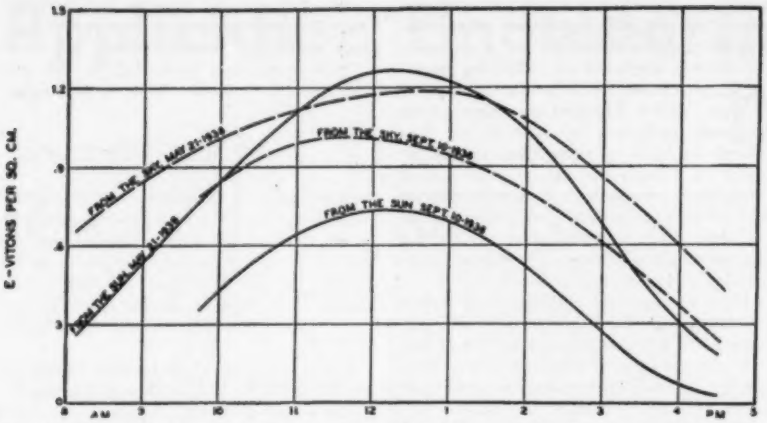


Fig. 7—Ultraviolet energy incident on a horizontal plane from the sun and from the sky on two clear days

flecting surfaces, new methods, and new lighting technique. *(27)*

The search for even more efficient light sources has continued, recent progress being especially evident in the high-pressure mercury and other forms of vapor lamps. By coating the inside of a low-pressure mercury-vapor lamp with a zinc silicate, it is possible to obtain a green light at an efficiency of 60 lumens per watt. *(28)*

Reading ability and fatigue have been compared in daylight and artificial light of the same foot-candle value. No difference was found, despite the fact that the total reflected energy from a sheet of white paper is ten times greater for the latter, due to the larger proportion of infrared or heat radiation in artificial light. *(29)*

A two-year study was recently completed of the ultraviolet energy in daylight at Cleveland (Ohio). *(30)* A great reduction in ultraviolet in winter was found, due mainly to shorter days, lower altitude of the sun, and greater cloudiness. Another interesting discovery is that for about eight months of the year a clear sky contributes more than half of the short-wave ultraviolet energy incident on a horizontal plane (Figure 7). Even during the other four months the ultraviolet from the sun on a horizontal plane on clear days exceeds that from the sky for only a few hours at midday. Thus, it is revealed that direct exposure to the sun is not essential to obtain the benefits of ultraviolet in daylight. By correlating the number of E-vitons per hour of ultraviolet energy given by the sun, the sky, and various types of sun lamps with the dosages required to cure rickets or produce sunburn, precise knowledge is being gathered of the comparative health benefits of all sorts of natural and artificial lighting.

During the year a study was made of visibility in hospital operating rooms. *(31)* For the first time, lighting engineers measured the seeing conditions in the actual incision during a wide variety of operations. Visibility readings were made by an operator standing at all times directly behind the operating surgeon and peering over his shoulder. The visibility readings varied over a wide range emphasizing the tremendous variation in seeing tasks encountered by the surgeon. As a result of these studies, quantitative recommendations, heretofore a matter of opinion, can now be based on factual scientific knowledge.

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◆ Bennett Inc. Opens Size Plant at Picayune, Miss.

Bennett Incorporated has recently announced the opening of a new plant at Picayune, Miss., for the manufacture of rosin size and rosin-wax sizes.

The new plant will incorporate many modern improvements in size-making processes. Arrangements have been made to manufacture size continuously from molten rosin as it comes from the still, thus saving the usual expense involved in drumming rosin and in heating and cooking prepared size. A new type of rosin wax has also been developed which can be shipped at high solids concentration in tank cars, greatly reducing the transportation costs, heretofore necessary when shipping this type of size.

The plant is well located with respect to supply of raw materials and within reasonable distance of several of the large Kraft mills that have recently completed construction of new units.

◆ Investigate Site for Swedish Paper Mill

An appropriation has been granted the Committee of Investigation for the Province of Western Norrland, Sweden, to look into the possibilities for the construction of a high quality paper mill in that area. It has been thought that it might eventually be feasible to construct such a mill in conjunction with an existing sulphite pulp mill and the preliminary investigations will have bearing primarily on the technical and economic aspects of the plan.

Canadian Technical Section

Holds Highly Successful Meeting

ON JANUARY 26, 27 and 28 the Technical Section of the Canadian Pulp & Paper Association held its Twenty-fourth Annual Meeting in Montreal. A very carefully drawn up and well balanced program was presented, in which due consideration was given to the interests and requirements of the various branches of the Canadian pulp and paper industry. The papers were of a very high order and resulted in much valuable and interesting discussion.

As the President of the Association had several simultaneous assignments, at the suggestion of the Chairman of the Section his address was postponed to the luncheon.

The meeting opened with the presentation of the Chairman's report. The ever-increasing importance of the technical man in the industry was strongly reflected in the membership of the Section, which increased by over 40 during the past year and now stood at close to 300. During 1937 much thought had been given to the work being done and to be done at the Research Institution. It was felt that the work of the Institute must be expanded so as not only to follow, but to anticipate the needs of the industry, and the conclusion had been reached that this could not be effectively accomplished without a full-time director of research.

As the various committee reports had been preprinted and distributed to members beforehand, they were taken as read.

Newsprint Operation at High Speed

The first paper on the agenda, presented by A. J. Edwards, dealt with *High Speed Newsprint Operation*. The author discussed the various problems encountered in speeding up the paper machines at the Dalhousie mill of Canadian International Paper Co. from 1100 to 1400 feet per minute, taking up in turn each part of the machine from the stock mixers to the reel and touching upon the major points which had been found pertinent to high speed operation, it being kept in mind throughout the period of increasing speeds that the final newsprint quality must be commensurate with the publishers' demand for good paper suitable for use on high-speed presses.

Replying to a remark by Lorne Anderson that the freeness reported seemed low for the speeds and suggesting that the instrument used might be giving a "false reading", Mr. Edwards explained that they had a closed white-water system at Dalhousie, and that the white-water had quite a high consistency. This naturally brought up the ever-recurring question of freeness and paper machine drainage, and James d'A. Clark reiterated the opinion he had expressed at previous meetings that freeness was not a proper test for evaluating the behavior of pulp on the paper machine. Whereas it is generally considered that an increase in paper machine speed necessitates increased freeness of the ground wood, this holds only to a certain point; if it were continued up to very high speeds, the groundwood would be so coarse that it could not be formed into paper. On the contrary, at the very high speeds, some decrease in freeness becomes necessary in order to obtain proper sheet formation.

In reply to questions concerning slime control, Mr. Edwards stated that most effective control was obtained by using alternately copper sulphate and sulphuric acid on the white water and chlorine in the fresh water. The best results were obtained with intermittent dosage of copper sulphate; after it had been used for some time, the slime began to turn green, indicating that it was becoming resistant to the copper, and by alternating with sulphuric acid this tendency was quite effectively checked.

Cowan Processing System

J. H. P. Grenier gave an interesting paper on *Vapor Removal with the Cowan processing System* in which, after a few remarks with regards to the history of the system and how the St. Lawrence Paper Mills Co. became interested in it, he described in some detail the experiences of the company's Trois-Rivières mill since the installation of the system on their number 1, 160-inch machine, in July, 1935. This was an old machine, installed in 1922, and had always been a source of trouble and worry; the actual cause of the troubles had never been found, but they were attributed to the dryers and ventilation. After installation of the Cowan system it acted in a perfectly normal manner. The improvement in the operation of this machine had been so marked that the management installed the system on its Number 2 machine, and the installation of Numbers 3 and 4 machines will be coming soon.

Mr. Hunter, of Great Lakes Paper, wished to know to what extent proper control of the air admitted to the hood improved the variation in moisture content across the sheet, and Mr. Grenier stated that with proper control this variation could be reduced and maintained at not over 1 per cent.

Mr. Cowan, the inventor of the system, explained that the air introduced under the hood not only serves as a carrier for water vapor, but actually sweeps out free water. While this might at first sight seem difficult to believe it must not be forgotten that air very easily carries free water as mist and this is sometimes very difficult to get rid of completely. The mist could actually be seen in the exhaust duct from the hood. In reply to a question by William G. MacNaughton, of the Newsprint Service Bureau, he stated that the baffle openings were the same size at the wet end and in the center of the hood, but were smaller at the dry end.

Mr. MacNaughton also wished to know whether the arrangement of the baffles was complicated and if they were difficult to operate. Mr. Grenier explained that it took the men some time to become thoroughly familiar with the mechanism, but after that they had no trouble. Since the installation of the system on Number 1 machine, they had experienced no felt trouble; they used the same felts as before, and though they cut out one of the felt dryers, they had no more wet streaks on the sheet.

Luncheon Meeting

At the luncheon, R. A. McInnis, president of the Canadian Pulp and Paper Association, brought out the importance of forest industries as a whole, and of the pulp and paper industry in particular, in the economic life of the Dominion, and forecast for it a development which would overshadow past developments. This, however, required vision, and it required research. The industry, as a unit, is at present spending only some $30,000 to $35,000 a year on research, showing quite clearly that it does not yet truly believe in research. The technical men were the ones who could best appreciate the necessity for and value of research and they in turn must sell the idea to the company executives.

Dr. L. A. Hawkins, of the General Electric Research Laboratories, Schenectady, N. Y., gave a most interesting and inspiring address on Research, which he defined very broadly as a "seeking after knowledge." Research in both pure and applied science is steadily advancing, and although immediate results are usually unpredictable, new things are bound to be discovered which will be taken into the daily life of civilization.

The Cabaret Dinner at the 1937 meeting, which was held under the auspices of National Business Publications, publishers of Pulp and Paper Magazine of Canada, had netted a handsome surplus. This was presented to the Technical Section in the form of a complete set of the Encyclopedia Britannica, which had been handsomely bound at the Garden City Press Gardenvale, Quebec.

At the afternoon session R. J. Chambers made a study of the Grewin System, in which he presented general data collected about five Grewin-equipped machines located in different mills. The results show that the Grewin system will decrease steam pressure on the dryers very considerably and effect a steam saving of about 500 to 600 pounds of steam per ton under normal conditions; there is also a cost improvement due to higher moisture at the reel, and an improvement in the finish of the sheet. While the data collected did not indicate

a marked improvement in moisture variation across the sheet, improvement in reeling conditions would tend to indicate that some improvement in uniformity of drying had occurred. The system, however, is not necessarily a cure-all and may require a certain amount of change or adjustment before it accomplishes the desired result.

Grinding Control Data

J. Edwards, H. A. De Luca and H. Wyatt Johnston contributed a paper on *Data for Grinding Control*, which was read by Dr. Edwards. The main feature of the work was the development of a method of expressing stone sharpness numerically, thus making possible the correlation of grinding data in a form useful for predicting the effects of various combinations of operating conditions. Curves were given showing the effects of production rate on energy consumption, burst strength (Mullen), white-water content, freeness and the energy-quality factor; and from these, further curves were constructed showing the relation between the sharpness factor and energy consumption, burst test, etc. Finally, examples were given showing the usefulness of these relationships to predict the changes that take place through manipulation of the two process variables, sharpness and pocket pressure. While it was not claimed that the results obtained on a miniature grinder were directly translatable to mill conditions, Dr. Johnston stated that there were reasons for believing that they were; Mr. Burchard, of Fraser Companies, on the other hand, was not very optimistic as to the possibility of predicting the results of changes in operating conditions on a commercial scale.

The paper aroused considerable interest, and numerous questions were put to Dr. Edwards and valuable suggestions made regarding various lines along which the work could profitably be continued. James d'A. Clark considered the authors deserved special credit for having succeeded in expressing numerically such an elusive factor as stone sharpness.

Officers Elected for 1938

The Section next proceeded to elect its officers for 1938, and the following were elected unanimously: *Chairman*, Dr. G. I. Hoover, Provincial Paper Co.; *Members of Council*, I. H. Copeland, Canadian International Paper Co., W. B. Scott, Consolidated Paper Corporation.

The Imperial Oil Co. exhibited a highly instructive "talkie" film on Lubrication, which was prefaced by a few introductory remarks by Mr. Tanner, who outlined the part played by improved lubrication in making possible modern progress and made special mention of oxidation-resistant lubricants.

Grinding Action Analyzation

The last paper of the afternoon, also prepared by J. Edwards, H. A. De Luca and H. Wyatt Johnston and read by Dr. Edwards, gave an *Analysis of the Grinding Action*. Experimental evidence was offered to prove that dulling a stone face by grinding entails the formation of a rounded contour to the leading edges of the grits; the action of these rounded edges was compared to the action of a beater, and certain similarities were noted; but this similarity should not be stressed unduly. From a discussion of the possible role played by the heat produced in the grinding stone and from the results of experiments, it was concluded that the increased plasticity of wood at high temperatures facilitates the removal of fibers, thus increasing freeness, fiber length, Paterson number, and production.

James d'A. Clark inquired whether any direct measurements had been made on the increase in plasticity of wood with temperature or on the possible influence of the viscosity of water at high temperature. Dr. Edwards replied that no direct measurements had been made; the purpose of the work was to try to get at the mechanism of fiber formation in the grinding operation, with a view to finding out how to make better groundwood.

The Thursday morning session was devoted to two papers of considerable interest and importance to the printing as well as to the paper industry. Both were by Dr. G. Larocque and described a continuation of the work which had drawn considerable attention and much favorable comment at the two preceding meetings of the Technical Section.

Testing Papers for Printing Quality

The first paper dealt with *Laboratory Methods for Measuring the Printing Qualities of Papers*. It gave a description of a laboratory method for comparing and evaluating the printing quality of sheets of paper by printing them with a hand-operated letter-press under controlled conditions of ink coverage and pressure. The amount of ink on the form and the per cent transferred to the paper are determined directly, by weighing a special 25-gram, 10 by 10-cm. steel plate before and after printing. The amount of ink transferred to the paper was shown to be proportional to the amount of ink on the printing form, and to increase with the printing pressure, the smoothness and the softness of the sheet. The quality of the printing, as determined by the appearance of the printed solids and half-tones, was shown to depend on the product of the smoothness and softness tests.

The shape of the rate of drying curve indicates that the drying of the ink takes place in two stages: in the first thirty minutes or so, the bulk of the ink dried by absorption of the vehicle into the paper, and this is followed by a very much slower oxidation of the ink. The amount of offset from a freshly printed sheet was found to be directly proportional to the surface oil-resistance and inversely proportional to the smoothness of the sheet. Softness is a third factor which affects the offset to a less extent; a high degree of softness decreases the offset.

The transfer of ink from press to paper depends largely upon mechanical consideration of adequate contact between ink and paper, as indicated by the smoothness and softness tests. The transfer of ink from paper to paper, however, as in offsetting, depends in addition upon the surface oil-resistance of the paper, since the drying of the ink by absorption is involved. If smoothness could be measured at printing pressure, it is likely that softness would not be a factor in the above tests.

At the conclusion of his paper Dr. Larocque briefly described the so-called "missing-dot" technic which has just recently been developed for testing the printing qualities of paper. It consists essentially in printing on the sample a pattern of dots, projecting the image thus obtained on a white sheet, marking each place where a dot is missing, and then counting the missing dots, which gives a measure of the printing "poorness" of the paper. The test is purely comparative, the results being referred to those obtained with a paper of known printing qualities. With a little practice and experience, the test is quite simple and rapid to carry out.

Oil Resistance of Paper

In his second paper, on General Laws Governing the Oil-Resistance of Paper in Printability, Dr. Larocque explained that the investigation of these laws was carried out in order to understand better the role which paper plays in the printing process.

The flow of oil into the paper is considered to take place through a system of capillaries of mean effective radius r and effective length ZC, which connect the two surfaces of the sheet; there are assumed to be N of these capillaries per square centimeter of paper surface, and the oil makes an angle of contact A with the capillary wall. The oil-resistance of the paper is considered to depend upon (1) the structure of the surface, (2) the structure of the interior of the sheet, and (3) to a lesser extent upon differences in the "wettability" to oil of the material.

The influence of temperature on oil-absorption is marked and amounts to about 9 per cent per degree Centigrade. Measurements of oil-resistance made at different temperatures must therefore be corrected by means of suitable viscosity-temperature tables. Paper samples should be stored and tested at low relative humidities, since an increase in atmospheric humidity irreversibly decreases the oil-resistance of the sheet. An increase in relative humidity from 40 to 95 per cent is capable of decreasing the oil-resistance by as much as 60 per cent.

Oil flotation measurements made with castor, tung, linseed, fish, mineral and white oils indicated that the absorption time is proportional to the quotient of oil-viscosity divided by surface tension of the oil, and is otherwise largely independent of the chemical nature of the oil.

The oil-resistance of a sheet, as determined by flotation, was found to be proportional to the square, and the air-resistance to the first power of the caliper. Dr. Larocque therefore deduced a method

for recalculating oil-flotation and air-porosity measurements to a standard caliper of 0.01 cm., in order to obtain what has been termed the specific internal oil-resistance and the specific air-resistance of the paper, and also the surface oil-resistance.

When the relationships thus obtained were applied to surface and flotation oil-resistance measurements on paper, it was found that both for hand sheets and for machine-made papers, the oil-resistance of the surface layer is from 7 to over 200 times greater than the resistance of a layer of equal thickness in the interior of the sheet. Consequently, although dependent to some extent upon the specific internal oil-resistance, the surface oil-resistance is influenced to a far greater extent by (1) the increased density of the surface due to surface tension forces closing up the surface during sheet formation, (2) the presence of numerous small regions of high oil-resistance, and (3) the increased surface density brought about by supercalendering.

Consequently, the surface oil-resisttnce of the sheet cannot be predicted from oil-flotation measurements corrected for caliper, even if the air-content of the paper is taken into account; the surface oil-resistance appears to be a distinct property of the sheet which must be separately evaluated by means of a suitable test.

It was found that, for the same bulk, the sheet containing the finer material is the more oil-resistant; thus, groundwood sheets are more oil-resistant that chemical pulp sheets of the same bulk. Similarly, sheets of greater oil-resistance can be obtained by beating and calendering than by wet-pressing to the same density, because beating and calendering produce a greater breaking-up of the fibrous material, and a consequently greater reduction in the capillary radius than can be obtained by wet-pressing.

The oil-resistance of a mixture of pulps can generally be calculated from the specific internal oil-resistance of the components.

A comparative figure for the "oil wettability" of a pulp can be obtained from the ratio of air-resistance to oil-resistance. Such "wettability" measurements were carried out on southern soda pulps of species varying in printability, and also on pulp sheets containing small amounts of added wetting materials. The presence of 2 per cent of rosin size was found to increase the wettability to oil by about 25 per cent.

As was to be expected, both these papers led to a quite animated discussion, which could have continued for a much longer time. As remarked by C. N. Candee and others, Dr. Larocque's work contained so much that was new and so much that was of very great importance, that it would take quite some time for mill men to digest and assimilate it all, and at the rate at which Dr. Laroeque was working and getting out results, it would be difficult for the men in the industry to keep pace with him.

President's Address

In his address at the Canadian Pulp and Paper Association luncheon on Thursday, R. A. McInnis, president of the Association, made a strong plea for a greater degree of co-ordination among the members of the Canadian Pulp and Paper Association and for continued co-operation with the federal and provincial governments. "Canada is the proud possessor of large forest areas, so it is important and urgent that the provincial and federal governments and the industry understand the importance of these forest areas to a rapidly growing world-wide demand. They and we must be very wise and prudent that we do not take any sudden or destructive action that would result in economic competition ruinous to ourselves. The premiers of Quebec and Ontario have already offered this industry their co-operation, and I believe that is also the policy of all the other timber-holding provinces in Canada", Mr. McInnis declared.

The speaker discussed the rapid growth of what, in Canada, is essentially, a 25-year-old industry, and remarked upon how it had become interwoven with the entire economy of the Dominion. This had been principally due to the increasing world demand for pulp and paper products; there was every indication that this demand would continue to grow as wide use was applied to pulp board in construction, to alpha pulp in the rayon industry, and to staple fibers in competition with wool and cotton. It was only a matter of time, opportunity and commercial competition before waste products from the chemical pulp industry received a profitable market.

While newsprint was the major paper product of Canada, it was important, when considering future operations, to note that other paper products and board figured much more largely in world consumption. In Europe in particular the demand for these types was likely to grow rapidly.

As production increased, many countries would have to rearrange their raw material supply, changing wholly or partly from wood to pulp and establishing converting plants for the products of consumption of their own country. Canada was in a favorable position to benefit from this change.

Mr. McInnis considered that at the present time there was no need for additional capacity in Canada; it would only require an annual increase of 2¾ per cent in production to double the output of the Canadian Pulp and Paper industry in 25 years; it would certainly be most unwise to try to meet any sudden increase by new productive capacity until it was certain that the increase in demand was permanent.

Referring to the present problems of the industry, Mr. McInnis stressed the need for additional statistical knowledge and for more extensive research. The greatest saving, he claimed, could be found in a more effective forest control. as the annual loss of wood due to forest fires and insect pests was greater than the annual wood consumption by the whole Canadian pulp and paper industry.

Session Given Over to Chemistry of Wood

The program as announced carried no contributions concerning the research being carried out into the *chemistry of wood* under the direction of Professor Hibbert. Thursday afternoon, however, had been left open, and, to the general satisfaction, it was put to very good use. After a very clear exposition by Dr. Jane Spier of our present-day knowledge of the mechanism of plant development and of photosynthesis in the tree, Dr. Hibbert gave an informal talk on the stage which has been reached in the investigations carried out under his direction during the past ten years on the constitution of lignin.

Some very interesting conclusions have already been reached, and it certainly seems as though we shall in the not distant future not only pierce the mystery of the constitution of lignin, but also gain an insight into the mechanism of the synthesis of both lignin and cellulose. Briefly stated, Dr. Hibbert's theory is that the plant uses carbon dioxide and water to synthesize formic acid, which in turn polymerizes to form saccharides. Part of the formic acid is also converted, by some as yet unknown mechanism, into phenolic substances, more particularly guaiacol derivatives. Amongst the saccharides, sucrose is one of the most (if not the most) constantly occurring in plants. Under conditions existing in plants it breaks down into glucose, fructose, mannose and galactose.

The glucose undergoes transformation into cellulose. The mannose goes to very stable mannan, which exists not only in soda and sulphite pulps, but also in alpha pulps and even in finished rayon. Galactose is converted onto galacturonic acid and pectic substances. Finally. the highly reactive fructose changes over to hydroxymethylfurfural which condenses with a guaiacol radical to form the building unit of lignin. While all this is as yet more or less hypothetical, it is based on considerable experimental evidence.

Klason's theory that lignin was built up of coniferyl alcohol or aldehyde units is thus invalidated, as the coniferin found by Klason in pulp waste liquors can readily be shown (according to Hibbert's theory) to be a scission product of the lignin molecule. Hilpert's theory that there is no such a thing in wood as lignin, but that it is formed during the process of its so-called extraction, also falls.

As a result of ten years' work, it can now be definitely stated that lignin is a definite plant entity which is a condensation product of guaiacol and fructose, essentially a product of the same type as phenolformaldehyde resins.

Sulphur Compounds and Their Reactions

Friday was devoted entirely to various aspects of sulphite pulp manufacture. G. B. F. Steven had quite a lot to say about *Troublesome Compounds and Reactions of Sulphur.* He described in detail the various methods which he used to detect and determine the different forms of sulphur in the burner gases, liquor, limestone and pulp, and presented his

analytical data in the form of curves and tables. He also followed the manufacture and processing of sulphite pulp step by step showing the possibility of the presence of troublesome sulphur residues and indicating means for ensuring their elimination. The general conclusions from this work were that the presence of troublesome sulphur compounds in the pulp can be attributed in the main to overproduction. Rushing the acid plant produces free sulphur; accelerating the cook introduces calcium sulphite; and incomplete washing leaves residual sulphur dioxide. Doctoring the pulp to remove these later is at best an uncertain cure.

Sulphite Pulp for Folding Box Board

Philip W. Codwise, of Beaver Wood Fibre Co., next gave his ideas concerning the *Requirements of Sulphite Pulp in Folding Box Board Manufacture.* In view of the rather uncertain state of the art, Mr. Codwise felt hesitant to attempt to discuss the pulp qualities that are needed by the board mill. The board manufacturer knows a good pulp when he gets it into the mill and uses it; but when it comes to describing the exact properties that are essential, difficulties arise. However, he considered that the important properties could be grouped as follows: (1) easily bonding, flexible fiber; (2) long fiber which has good strength with little beating; (3) good color, and (4) cleanliness. Dr. W. Boyd Campbell, of the Cellulose Research Institute, has started working on the problem of ascertaining definitely what are the properties required in sulphite for folding box board and of evaluating them numerically. A preliminary survey has indicated that a combined consideration of the following properties may give information of value: screen classification, Mullen test, Mullen test after folding, folding endurance, and breaking length.

The discussion which followed the presentation of this paper revealed quite a divergence of opinion. Some considered that sulphite pulp is sulphite pulp, and it is up to the board maker to adapt his operating conditions to obtain the results he wants. The board makers replied that when they have a satisfactory sulphite they can adjust their operating conditions to get the results they want; then, when they change their source of supply, they have no end of trouble and frequently have to increase quite considerably the proportion of sulphite in the furnish, thus showing that there are sulphite pulps and sulphite pulps. Mr. Brubacher considered that the board maker should tell the pulp maker what he wanted, and it then was up to the pulp maker to turn out a product that would meet these requirements. The important thing was therefore that board makers should tell the research men exactly what qualities they wanted, and that the research men develop methods of evaluating these properties so as to draw up definite specifications. The sulphite manufacturers would then be in a position to know what to do.

Newsprint Sulphite Production Variables

In discussing *Some Factors Affecting the Production of Homogeneous and Uniform News Sulphite,* E. Norval Hunter set forth circumstances and difficulties that have been encountered in the production of sulphite for two of the largest newsprint machines in the world, at the mill of the Great Lakes Paper Co. He first explained that by "uniformity" he meant the sameness of the pulp from cook to cook, and from day to day, while he used the term "homogeneity" to designate the sameness or uniformity of the fiber in any lot of pulp. A good news sulphite should possess both these qualities; unfortunately, pulp testing methods now in general use do not measure to any extent the homogeneity of pulp, and it would be highly advisable to devise methods which would measure this pulp characteristic. Wood variations have a tremendous effect on both the homogeneity and the uniformity of the pulp. High acid strengths improve homogeneity through better penetration. Investigation and experimentation with temperature schedules leads to the adoption of an amply long penetration period, which improves homogeneity, as does also improved circulation in the digester. The application of a time cam pressure controller on the digester relief aids pulp uniformity.

Referring to Mr. Hunter's remarks regarding acid concentration, Wm. G. MacNaughton, of the News Print Service Bureau, stated that this must not be considered in itself, but in relation to temperature and pressure. The acid concentration as charged into the digester is of relatively little importance, for when a given temperature and pressure have been reached in the digester their values will determine the sulphur dioxide concentration irrespective of what it may have been at the start. In order to maintain a high acid concentration throughout the cook. the pressure must be greater; yet, the best pulp is made by the Mitscherlich process which uses quite a low initial acid concentration. A factor which undoubtedly exerted a by no means negligible influence was the uniformity of the chips as regards both size and moisture content.

Dr. F. H. Yorston disagreed with Mr. MacNaughton's opinion as regards high initial strength of the acid. He considered that a strong acid served at least two useful purposes: (1) it helped to eliminate more rapidly the air present in the digester, and (2) it had a favorable influence on the temperature coefficient of the pulping process. There was no doubt that a considerable amount of cooking action took place below 100° C., without which there would be no penetration of the liquor into the wood, and high strength was very useful at this stage.

C. G. Malcolm wished to know whether pulling down the pressure before blowing made any change in the classification of the pulp. Mr. Hunter replied it had been observed, from microscopic examination of the fiber and not by screen classification tests, that the sooner you began to pull down the pressure the better the quality of the fiber.

Technical and Woodlands Section Luncheon

The joint Technical and Woodlands Section luncheon was presided over by J. O. Wilson, woods manager of Anglo-Canadian Pulp and Paper Mills, who had been re-elected chairman of the Woodlands Section. He called upon R. A. McInnis, who that very morning had been re-elected for a third term to the presidency of the Canadian Pulp and Paper Association, to say a few words. Mr. Innis said that he had already been doing far too much speaking during the past three days, and he merely wished to express the appreciation of the Council of the Association for the work done by the Technical and Woodlands Sections during 1937.

As a new departure, in order to enable members of the two Sections better to understand each other's problems, a number of questions asked by the Woodlands Section were answered by the Technical Section, and vice versa.

The first question, which came from the Woodlands Section, was: "What is the effect of wood density on paper production?" Dr. H. J. Rowley explained that, in the manufacture of sulphite, low wood density reduces digester capacity and gives bulky pulps, that is, pulps that produces bulk paper; moreover, variations in density entail certain difficulties in the processing of the pulp. In the manufacture of groundwood, low wood density requires more power for a given production, but the pulp obtained has more bulking properties which, though sometimes objectionable, is generally advantageous; the main effect of wood density on groundwood production, is one of cost.

The Technical Section wanted to know "Why do some species from different localities vary so much in density?" T. A. McElhanney, Superintendent of the Forest Products Laboratories of Canada, stated that this very question had just been discussed by the Woodlands Section, and the answer was to be found in the paper on Density and Rate of Growth of the Wood of Spruce and Balsam in Eastern Canada read before that Section by J. D. Hale and J. B. Prince. There apparently is no marked variation in density of a given species that can be attributed to locality alone. The main factor that governs the density of wood is its rate of growth, and accessory factors, such as the amount of compression wood and the age of the tree, also exert some influence.

In reply to the Woodlands Section's question, "Why do mill men prefer spruce to balsam for pulp and paper making?" Elliott Little told them that it was because they got a higher production from the same volume of spruce than of balsam; otherwise there was practically nothing to choose between the two, and they gave the same results, pound for pound.

The Technical Men next wanted to know how the Woods Men measured wood in the bush, and why. It was explained to them that wood must be measured in the bush to meet the regulations of the various Provincial Governments, and that the measuring was carried out by Govern-

ment-licensed scalers under specific instructions and according to definitely prescribed methods. These measurements were used as a basis of payment of stumpage dues to the government and also of paying the contractors and workers.

The Technical Section was then asked why green wood was preferred for grinding and dry wood for sulphite cooking. Lorne Anderson, of Ontario Paper, retiring chairman of the Section, said that this question had been answered by two papers given about three years ago at the summer meeting of the Technical Section. Green wood, he explained, requires more easily controlled grinding conditions to obtain the desired quality. On the other hand, dry wood gives a higher sulphite yield and does not require as strong a cooking acid as green wood.

The last question came from the Technical Section; it was: "Why carry such large wood inventories at the mill?" The reasons for this were numerous and quite sound. The most natural and most economical means of transporting the wood to the mill was by stream driving, and this in many cases was restricted by natural conditions to a period of a very few weeks in the spring and early summer; construction of railroads to bring the wood from the forest to the mill would entail prohibitive expenses, but the construction of truck roads may furnish a partial solution to the problem. A large proportion of the labor employed for cutting the wood consists of farmers who can go into the bush only in the winter, so that the year's supply must be cut during the winter. It not infrequently happens that large amounts of wood are brought to the mill in an effort to salvage fire- or insect-damaged wood that would become a total loss if it were left in the bush. Finally, leases to Crown timber lands frequently carry a clause stipulating a certain minimum annual cut, and in times of decreased demand, this may exceed the requirements of the mill, thus necessitating the accumulation of large stocks in the mill yard.

Characteristics of Fine Papers Sulphite

After the luncheon Dr. G. I. Hoover, Technical Director of Provincial Paper Limited, discussed *Sulphite Pulp for Fine Papers.* He described the characteristics of the types of sulphite pulp available in Canada for use in fine papers and the effect on these pulps of the mechanical treatment which they receive during the course of their manufacture into paper; and after discussing some of the desirable characteristics of sulphite pulps for fine papers, he suggested possible means of improving the manufacture and utilization of sulphite pulps.

Causes and Control of Dirt in Sulphite Paper

The annual meeting was brought to a close by W. A. Ketchen's paper on *Dirt in Sulphite Paper.* With a view to determining the reason for variations that occurred in the cleanliness of bond papers, statistical data collected over the last eight years were analyzed and discussed. The original problem of dirt control leads to a discussion of acid making and its effect on pulp quality. However, it does indicate that a number of process variables are traceable to variations in the cooking acid. The importance of control within narrow limits for any one condition is emphasized as a factor that affects cleanliness, bleach consumption and quality of the finished pulp.

◆ Chemical Societies Hold Meeting in New York

A joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society was held February 11, at the Chemists' Club, New York City, James G. Vail was the chairman and William M. Phillips, the guest speaker. Mr. Phillips gave a "Graphic Presentation of Electroplating Operations," the object of which was to show the mechanics of electroplating or electrodepositing operations.

The Messel Medal for 1938, awarded by the Society of Chemical Industry every two years for outstanding achievement in science, will be awarded this year to Dr. Leo H. Baekeland at the annual meeting of the Society in Ottawa, Canada, on June 20, 1938. The model was founded in 1922 in honor of Rudolph Messel, benefactor, one of the original members and twice president of the Society of Chemical Industry.

The annual meeting of all sections of the Society of Chemical Industry will be held in Ottawa, Canada, June 20-22, 1938. A full program of events extending over the period June 17 to July 1 has been arranged for the visitors from abroad, The American Section of the Society will entertain the members of the parent society at Niagara Falls, N. Y., on June 25, 26 and 27. Frank J. Tone is chairman of the Committee on Arrangements for the Niagara Falls visit. James G. Vail is chairman, American Section.

◆ Eaton Corp. Acquires Interest in Worthy Paper

Horace W. Davis, president of the Eaton Paper Corporation, has recently announced the acquisition of a "substantial" but not controlling interest in the Worthy Paper Company Association of Agawam, Mass.

Under the new arrangement, the Pittsfield stationery firm will continue its policy of buying paper from several manufacturers, while the Agawam mill will co-operate on developing new lines as well as supplying established ones to the Eaton Corporation.

◆ Scott Paper Plans Expansion Program

So that additional space may be provided for further expansion of manufacturing and administrative activities, the Scott Paper Company, Chester, Pa., has purchased land immediately adjoining its plant site on the Delaware River.

Although no immediate plans have yet been made beyond those for the construction of a bulkhead along the riverfront, the company probably will construct several buildings housing additional paper machines and supporting equipment on this land. This expansion may result in an expenditure of anywhere from two to ten million dollars, depending on how rapidly and along what lines expansion of the business takes place.

◆ New Crane Company Film

A new sound picture, entitled "Flow," which shows how valves and fittings give mankind control over liquids and gases, has been released recently by Crane Company, Chicago.

The picture shows scenes of rivers in flood, thundering waterfalls and primitive means of controlling flow. These scenes are followed by an educational tour through the Chicago works of Crane Company where the various steps in manufacturing with iron, brass and steel are revealed. It shows valves varying in size from towering giants to the small faucets used in homes.

The sequence of events shows how thousands of men co-operate to produce vital units for use in food products plants, oil refineries, power plants, water works, textile mills, etc.

Franklin Medallion which went to local winners at each of the 250 schools entered in the IPI Essay Contest on "Color," sponsored in co-operation with the National Graphic Arts Education Guild. Many schools presented the awards in connection with Franklin ceremonies held during Printing Education Week, January 16-22

Fernandina Pulp Mill Dedicated

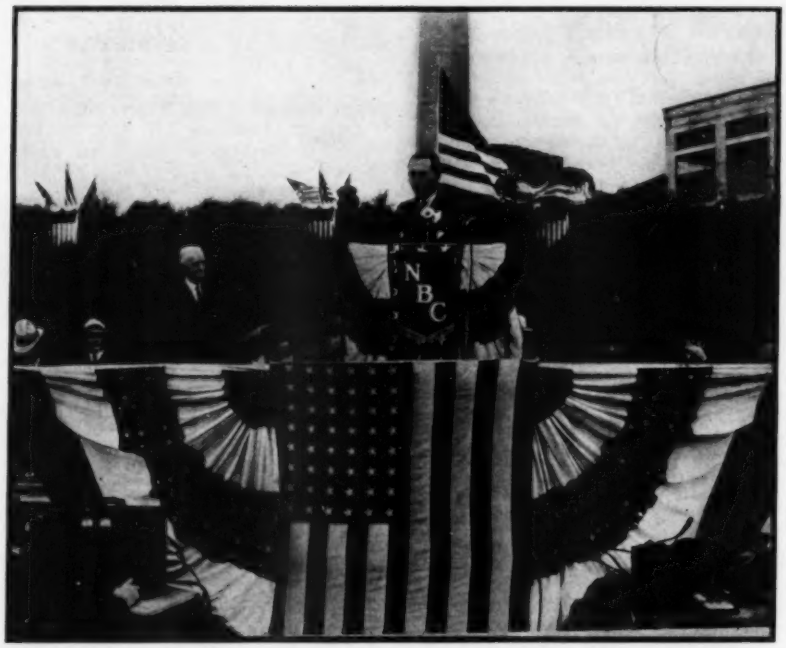
FERNANDINA, a small island city in the northeastern part of Florida, for several hours, January 14, was the center of interest for the paper-pulp industry of the United States. As the result of a gigantic celebration, Florida Industries Day, attention was directed to Dr. Charles H. Herty, the famed Savannah, Ga., chemist whose research has been a great factor in the development of the southern paper industry.

The first unit of the Container Corporation of America's $9,000,000 paper pulp mill was formally dedicated to Dr. Herty in the presence of some 4,000 persons, among them 300 industrial leaders, financial leaders and noted writers from Chicago, New York, Philadelphia, Baltimore, Washington, and Florida.

Secretary of Commerce Daniel C. Roper made two speeches regarding the industry that is creating a new spirit in the industrial South. He spoke for 15 minutes over a nation-wide radio network when the plant was dedicated, and again at a banquet in Jacksonville, Fla., where Gov. Fred P. Cone was the host. James G. Stahlman, president of the American Newspaper Publishers Association, was another important speaker.

In reference to the opening of the new mill which has had a part in creating something of a business boom in Fernandina, Dr. Herty said: "Twenty-five years ago the suggestion that pine could be used to produce kraft paper was laughed at by those who should have known better. Shortly the South will be producing approximately 90 per cent of the kraft products used in this nation."

Other distinguished guests who spoke in Fernandina were United States Senator Claude Pepper, Gov. Cone and Walter P. Paepcke, president of the Container Corporation of America. Gov. E. D. Rivers of Georgia was among those present to honor Dr. Charles H. Herty.



Walter P. Paepcke, president of Container Corporation of America, speaking before 4,000 persons at Fernandina, Fla., during celebration of Florida Industries Day on the occasion of the dedication of the company's new $9,000,000 pulp mill. Dr. Herty, who was the guest of honor at the celebration, is standing at the speaker's right

An elaborate program, both educational and entertaining was worked out for the public. Many organizations, including the Florida State Chamber of Commerce, Jacksonville Chamber of Commerce and the civic leaders of Fernandina centered activities in this direction for weeks. Several governmental agencies, the Department of Commerce, Department of Agriculture and the Forestry division of the latter department contributed to the occasion.

The entire population of the small city was organized to entertain and act as hosts to the visitors. Mayor P. C. Kelly followed Governor Cone's good example and by official proclamation made January 14 a holiday in Fernandina.

The huge mill, which will provide new income for 5,000 Florida families, was the setting for the noon-hour program. The mill was open to the public from 9 to 11 a. m. and again from 1:30 to 2:30 p. m.

Fernandina's story of its rise in the industrial world was broadcast for one hour, 12:30 to 1:30 on a nation-wide radio network. All of the talks and introductions of guests were made over the radio in front of the audience. The citizens of Fernandina fed several thousand persons a sumptuous sea food luncheon. All cafe owners and hotel proprietors in the town were drafted to aid in preparing the biggest luncheon any community this size ever attempted.

Container Corporation of America of-

Secretary of Commerce Daniel C. Roper, who was one of the prominent speakers at the Florida Industries Day celebration

ficials said the new mill will give steady employment to at least 175 men in the plant proper. Two hundred other men will be employed in procuring the pine which is used in manufacturing pulp paper products. The wood requirements of the mill will give a new cash income to about 5,000 families and thousands of dollars will be added to northeastern Florida's payrolls.

Within a radius of 150 miles of Fernandina is an area of 10,000,000 acres of the most rapid growing pine timber in the world. Slash pine flourishes in this territory. These ten million acres will reproduce at the rate of from one-half to one and one-half cords per year per acre without reducing the supply of standing timber.

The new mill has a capacity of 125 tons of kraft pulp daily. The construction of the plant gave employment to hundreds of men over a period of ten months and Fernandina's population jumped by several hundred when the mill site was staked off by surveyors.

One of the officials of Fernandina pointed out what such enterprises mean to this community by saying that no section of the United States is more in need of industry than this part of the South. Pine such as will be used in the new mill is grown in marginal forests that stretch across Florida, Georgia, Louisiana, Mississippi, the Carolinas and Alabama.

The southern pulp and paper industry must at the outset for its own preservation recognize three primary factors, which, if unobserved, can bring disaster, agriculture authorities explain. Reforestation, selective cutting and co-operative working programs with other forest industries are the factors.

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◆ Old Timers Dedicate Plaque to Robert Gair

A bronze memorial plaque in memory of Robert Gair, founder of Robert Gair Co., Inc., was dedicated recently by members of the Gair Old Timers Club near the site of the old paperbox factory in Brooklyn, N. Y. The plaque, containing a bas relief protrait of Mr. Gair, together with a brief eulogy of the industrial pioneer, is the work of Joseph Nicolosi, the distinguished sculptor. The unveiling ceremonies marked the fifth year of the Old Timers Club's existence.

The man in whose memory the plaque was erected was, for many years, a leading industrialist of Brooklyn. Born in 1839, he served throughout the Civil War in the Union Army and was mustered out a Captain. Within sixty days he established himself in business as a paper jobber and from this point developed what is known today as Robert Gair Co., Inc. During this early period Mr. Gair built building after building until his factories and real estate holdings became a city within a city and was commonly called "Gairville." He built the first reinforced concrete building for factory purposes and continued to build until he had over two million square feet of floor area.

As quoted from Lewis Mumford in a booklet issued by the company: "Robert Gair was a figure; to understand him, to understand the industry he helped create, is to have a keener insight into the material force of modern civilization. More than any personality except that of Roebling, the creator of the Brooklyn Bridge, Robert Gair most certainly dominated the Brooklyn waterfront."

◆ Worthington Acquires Interest in Moore Steam

The acquisition of an interest in the Moore Steam Turbine Corporation of Wellsville, N. Y., has recently been announced by the Worthington Pump and Machinery Corporation, Harrison, N. J. This association adds to the list of products sponsored by Worthington, an extensive line of steam turbine equipment and in turn provides Moore with the benefit of Worthington's resources in matters pertaining both to application and metallurgy.

◆ PRELIMINARY PLANS are now under way for the annual Wisconsin River Valley Safety Conference which will be held June 9 at Antigo. Oscar F. Duus, safety inspector at the Tomahawk Kraft Paper Co., is chairman of the paper pulp division and C. H. Hansen of Wausau is head of the all trade division.

◆ Ohio TAPPI Elects Officers

The Ohio Section of the Technical Association of the Pulp and Paper Industry held its second annual meeting on January 8 at the Anthony Wayne Hotel, Hamilton, Ohio. Vincent Waters was the presiding officer.

Theodore Chemerys, Champion Paper and Fibre Co., as chairman of the nominating committee, presented the following slate of officers: Chairman, Homer Latimer, Champion Paper and Fibre Co.; Vice-Chairman, Howard Laymon, Mead Corporation; Vice-Chairman, Howard Harrison, Crystal Tissue Co.; and Secretary-Treasurer, John Burdsall, Crystal Tissue Co. Vincent Waters was elected chairman of the executive committee.

Chairman Waters then introduced Ronald G. Macdonald, national secretary-treasurer of the TAPPI, who gave a resume of the papers to be presented at the New York meeting in February. Following this Clarke Marion, vice-president of the Champion company, gave an interesting talk concerned with co-operation between research and development, control laboratory and other technical workers with the men in the mill proper.

Dr. Robert A. Diehm, Rohm and Haas Co., Philadelphia, spoke on the use of Enzymes in the paper industry and Henry Keller and G. H. Woody, Link-Belt Co., Philadelphia, presented an illustrated lecture on PIV gears.

News Print Paper in 1937

ROYAL S. KELLOGG

NORTH AMERICAN news print production in 1937 established a new high figure of 4,944,000 tons. This was half a million tons more than in 1936, and 549,000 tons more than in the previous record year of 1929. The 1937 output of news print in North America was probably also 56 per cent of a world output in the neighborhood of 8,900,000 tons—the latter figure being only a rough estimate at this time. Nearly all the industry ran close to capacity with the facilities available during 1937, and operating ratios were undoubtedly higher than in any year since 1926.

The 1937 North American news print production total was made up of 3,645,000 tons in Canada, 946,000 tons in the United States and 353,000 tons in Newfoundland, or in the ratios of 74 per cent in Canada, 19 per cent in the United States and 7 per cent in Newfoundland. Canadian production was 455,000 tons or 14.2 per cent more than in 1936, United States production gained 25,000 tons or 2.6 per cent over the previous year, and Newfoundland production was 25,000 tons or 7½ per cent more than in 1936. The Canadian figure, of course was far and away greater than ever before attained. Production in the United States was in practically the same volume as in 1933 while the Newfoundland output was 17,000 tons more than the previous mark established in 1935.

The continental output in 1937 went so far ahead of 1929 that the latter year will no longer serve as the outstanding reference mark.

Exports

Exports of news print paper from Canada during 1937 were 3,455,000 tons, according to official Ottawa statistics. This was a gain of 15 per cent over exports of 2,993,000 tons in 1936.

Shipments to the United States from Canada last year were 2,899,000 tons or exactly 500,000 tons more than in 1936—a gain of 21 per cent.

Overseas shipments of Canadian news print in 1937 amounted to 556,000 tons, a decrease of 38,000 tons or 6 per cent from the record-making figure of 594,000 tons reached in 1936. With the exception of 1936, however, Canadian overseas exports of news print last year were the largest of any year on record.

Canadian news print had practically world-wide distribution in 1937. By far the largest overseas destination was the United Kingdom, with Australia a strong second and Argentina third. Shipments to the United Kingdom in 1937 were much larger than in 1936. This was also the case with shipments to South Africa, Argentina, Mexico and Cuba. On the other hand, there was less movement of Canadian news print to Australia, New Zealand, Chile, Japan and China in 1937 than in 1936.

Exports of news print from the United States, while somewhat more than in 1936, were only some 17,000 tons in 1937, and of little moment in the international distribution of that commodity. The principal external users of United States news print were in Cuba, Central and South America, China and the Philippines.

Imports

Imports of news print paper into the United States from all sources totaled 3,317,000 tons in 1937—an increase of 565,000 tons or 21 per cent over the 1936 importations.

The news print paper imported into the United States last year came to the extent of 88 per cent from Canada, 9 per cent from Europe and 3 per cent from Newfoundland. Canada's news print shipments to the United States were 80 per cent of her production. The 294,000 tons of news print which came across the Atlantic Ocean to the United States in 1937 was a much larger quantity than ever before received from overseas. Nearly 102,000 tons arrived from Sweden and almost 155,000 tons from Finland. More than 24,000 tons came from Norway and 13,000 tons from Germany. These were new high figures for news print receipts from Sweden and Finland, but a much smaller quantity from Germany than the peak of 52,000 tons in 1923. The largest quantity of news print ever to come into this country from Norway was also in 1923 with nearly 34,000 tons. On the other hand, importations of news print from Finland have more than doubled since 1935.

Consumption

By no means was all the news print paper shipped into the United States in 1937 used in that year. There was a heavy accumulation of stocks in the hands of publishers due to a smaller consumption in the latter half of the year than anticipated, and also to the building up of supplies against a price increase in 1938. Nevertheless, the total use of news print paper in the United States last year was around 3,830,000 tons. This was 180,000 tons or 5 per cent more than in 1936 and 50,000 tons more than in the previous peak year of 1929. On the basis of population the per capita use of news print in the United States in 1937 was slightly more than 59 pounds, whereas the per capita consumption in 1929 was a little more than 62 pounds. On the other hand, the 59 pounds per capita used last year was a most substantial comeback from the slightly less than 43 pounds used in 1933.

The most cheerful item to both news print paper manufacturers and newspaper publishers is the still growing volume of newspaper circulation. According to the compilation by *Editor & Publisher* the total circulation of English language daily and Sunday newspapers in the United States for the twelve months ending September 30, 1937, was 72,376,000 copies. This was a gain of 3 per cent over the corresponding period a year earlier and of 22 per cent from the low point of the depression. In fact, newspaper circulations in the United States are now 9 per cent above the level reached in 1929-30. Canadian English language daily and Sunday newspapers are also doing well with 19 per cent more circulation than in 1933 and 5 per cent more than in 1929.

It is this large and sustained newspaper circulation which furnishes the substantial foundation for news print consumption, despite disappointing advertising volume at the present time.

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◆ May Build Newsprint Mill in Georgia

That Georgia may soon have a newsprint mill seems altogether likely in view of the bill recently introduced in the State Legislature providing for creation of the Georgia Wood Pulp Development and Conservation Authority and further authorizing said body with the power to issue bonds up to $5,000,000 for the construction of a mill.

Under the terms of the bill the Authority will be a public corporation comprising three members appointed by the governor. Building of the mill would begin six months after passage of the bill and appointment of the members of the Authority, it is said.

The location of the mill would be left to the Authority but obviously a central location will be favored because of the market for growers whose timber is at a distance from the coast, where the only markets are now located.

At present the plan is to lease operation of the mill to a company to be formed by Lester W. David of Seattle, Wash., prominent lumber operator, who has been attracted by Georgia's newsprint possibilities. The lessor would pay a rental of $10 per ton on the mill which would be capable of producing about 200 tons per day. It is reported that Mr. David has declared that he can produce newsprint at a cost of $20 per ton although the estimate of Dr. Herty is said to be about $25 per ton.

◆ Electrochemical Society to Meet in Savannah

The Electrochemical Society, Inc., will hold its annual meeting April 27, 28, 29 and 30 in Savannah, Ga., it has been announced by Philip McG. Shuey, chairman of the local committee. Registration will be at the Hotel DeSoto and there will be many interesting topics discussed at the general sessions. Included among the many speakers are Dr. Charles H. Herty and D. H. Bissell of the Chromium Corporation of America. Mr. Bissell will speak on "Chromium Plating for the Paper Industry."

◆ Eastern Files 77B

A petition for re-organization under Section 77B of the Bankruptcy Act was recently filed by the Eastern Manufacturing Company in the Federal District Court of Maine. Federal Judge John A. Peters approved the petition and continued the company in temporary possession of the property, directing that all claims and interests of creditors and stockholders be filed on or before March 1, 1938.

The company announced through Edward M. Graham, president, that it had discussed plans of re-organization with its bank creditors and important holders of its bonds, preferred stock and common stock, and that it expected to file with the court a complete re-organization plan within 30 days. Meanwhile, operations will be continued under supervision of the court.

◆ Alex. Thomson Jr. Now Adv. Manager at Champion

Succeeding the late E. Kenneth Hunt as advertising manager of the Champion Paper and Fibre Company, Hamilton, Ohio, is Alexander Thomson, Jr., who has been connected with the company for the past ten years.

Mr. Thomson was employed successively in the paper mill, research department and in sales promotion and advertising work at Hamilton and was then transferred to the Cincinnati office where he was engaged in selling. Since October 1, 1935, Mr. Thomson has been assistant manager of the Cleveland sales office. In his present position he will be located at the company's main office in Hamilton, Ohio.

◆ Dr. Carpenter Made Ass't Director of Savannah Lab.

Dr. Charles H. Carpenter, formerly chief chemist of the Savannah Pulp and Paper Laboratory, is now assistant director, according to an announcement by Dr. Charles H. Herty, director of the Georgia laboratory.

Dr. Carpenter received his training both in the United States and Germany. He was an American-German exchange student at Darmstadt Technische Hocshule and graduated from the latter institution in 1933 with the degree of doctor of engineering. He took his M. S. degree in 1931 at the New York State College of Forestry. Before coming to the Savannah Laboratory, Dr. Carpenter did work at the Institute of Paper Chemistry and Carnegie Institute of Technology.

◆ Stadler Now President of Lake Sulphite Co.

John Stadler, pulp and paper mill designer, is now president of the Lake Sulphite Pulp Co., Ontario, succeeding R. O. Sweezey, chairman of the board of directors. Directors of the company are: J. A. Simard, Bethume Smith, Gordon Leitch, Fred Connell and J. W. McColl. The Red Rock plant is nearing completion and J. B. Beveridge, new general manager, is expected soon.

◆ Appoint Representatives for Zeiss Instruments

Zeiss industrial measuring instruments are now being distributed by Carl Zeiss, Inc., New York City, which firm has announced the appointment of several district representatives to handle the Zeiss line. A large and well-equipped repair shop is maintained in New York by Zeiss for the benefit of customers while the recently-announced representatives in Cleveland and Dayton, Ohio; Pittsburgh, Pa., Chicago Ill., and Belmont, Mass., will handle sales and servicing of the extensive line of precision gauging tools. Announcement of other representatives will follow.

The new line includes instruments for measuring and gauging lengths, for checking angles and angular divisions; for checking gears, gauging and measuring threads and various miscellaneous measuring instruments, useful for the manufacture of machine tools, in the automotive industries, in ball bearing manufacture and telephone, radio, arms and aviation fields.

◆ Fairbanks-Morse Moves Into Modernized Offices

Fairbanks, Morse and Co., has moved its general offices to the modernized Fairbanks-Morse Buildings at 600 S. Michigan Ave., Chicago, but four blocks from the building at 900 S. Wabash Ave., which was the company's headquarters for a third of its 108 years.

The company's new quarters have been completely remodeled and redecorated. New facades on both its Michigan Ave. and Harrison St. sides give the building a modern appearance in keeping with its interior treatment. A new elevator system, attractive wood paneled elevator corridors. glass-block office partitions and other improvements combine practicality with attractiveness to provide ideal offices. The building is only eight blocks from the site of the Fairbanks-Morse store on State St., which was destroyed by the Chicago fire.

◆ Large Expansion Program Under Way at Hoberg Mills

Hoberg Paper Mills, Inc., Green Bay, Wis., is undergoing a $200,000 expansion and improvement program, it was announced recently by President J. M. Conway. About three-fourths of the total cost is being expended in the sulphite mill and bleach plant of Division "B", which improvements will be completed by next July. Division "A" improvements, including new installations in the printing department, converting division and machine shop, have already been completed at a cost of $50,000.

Among the latter improvements are: a new three-color Kidder rotary printing press, a new Farrell roll grinder, a new rotary type interfold paper towel machine, rotary interfold toilet tissue unit, automatic tissue wrapping machine for toilet rolls and one new high speed rotary type paper napkin folding machine. The latter four units added to the converting department were manufactured by the Hudson-Sharp Machine Co., Green Bay.

In Division "B" improvements include a new 12-ton sulphite digester, built and erected by the Manitowoc Engineering Co.; Oliver pulp thickener conveyors; three tile tanks for storage of slush pulp and water built by Kalamazoo Tank and Silo Co.; and the installation of a Kamyr pulp lapping machine for lapping bleached and unbleached pulp.

◆ G-E Begins Celebration of 60th Anniversary

Beginning the celebration of the General Electric Company's 60th birthday, Charles E. Wilson, executive vice-president, recently paid tribute to the vision and courage of Edison, Steinmetz, Sprague and other electrical pioneers, in a speech given over a national network radio program from Schenectady.

Mr. Wilson pointed out that it was on October 15, 1878, that the Edison Electric Lighting Company was incorporated. It was the first of the companies that were eventually merged to form the present General Electric Company, presaging 60 years of achievement which have so added to the comfort of living.

Although Mr. Wilson's speech was in celebration of G-E's 60th anniversary, further plans for continuance of the company's observance of the year, have not, as yet, been announced.

◆ New Mill Supply Company

An important new addition to the business of distributing supplies for paper and pulp mills in Wisconsin is the new Industrial Supplies Corporation, Appleton, Wis. The firm has been organized by two men well known to paper mill men through their many years of association with the Kimberly-Clark organization; S. R. Stilp, Jr., and Frederick C. O'Keefe.

Both Mr. Stilp and Mr. O'Keefe are thoroughly familiar with the purchasing, materials and operating problems of paper mills. Mr. Stilp took up chemical engineering at the University of Wisconsin and Mr. O'Keefe was graduated from Niagara University with the degree of B.B.A.

The two men are already well established and at present the list of companies they represent are: Chicago Belting Co., Aluminum Industries, Inc., Johns-Manville Sales Corp., L. H. Gilmer Co., Mercer Rubber Co., Acme White Lead & Color Works and Advance Car Mover Co. In addition to paper mills they will also sell supplies to all other industries in the Northern part of Wisconsin.

◆ Northern Co. Moves Its Office Building Intact

Northern Paper Mills, Green Bay, Wis., is undertaking the rather unusual engineering feat of moving its two story office building to a new site two blocks away in order to make way for construction of a new $750,000 steam power plant. Business will be carried on as usual and flexible connections will be run to supply heat, light, telephone and teletype services. The job is being done

by G. W. Kennedy and Sons, a Green Bay moving firm.

Mill officials hope to have the power plant completed and in operation by Jan. 1, 1939. The new electric generating plant boilers will have a steam pressure of 600 pounds or more per square inch. The steam will be fed to two turbines, one of 3,000 kilowatt capacity, the other of 2,000 kilowatt, approximating 6,600 horsepower. The engineering contract for the steam plant has been awarded to Sargent and Lundy, Chicago.

◆ Inexpensive Newsprint Process Announced

A relatively inexpensive process for making newsprint and synthetic cotton from waste farm products was claimed to have been discovered recently by Dr. Frederick W. Hochstetter, Pittsburgh scientist and former worker with Thomas Edison and Charles P. Steinmetz, according to press reports.

Under the process, Dr. Hochstetter said, newsprint could be produced for about $30 a ton. The press dispatch stated newsprint would be more flexible, less brittle after exposure to light, would not discolor and would be more opaque and take less ink than paper now in use.

The inventor said he obtained a product which, after bleaching, is similar to ordinary wood pulp, by hydrating straw, treating it chemically and then dehydrating it. Either synthetic cotton or newsprint can be produced, he said.

◆ DuPont Invites Paper Men to "Cavalcade" Broadcast

E. I. du Pont de Nemours and Company has extended an invitation to TAPPI members and all others who are in New York in connection with the forthcoming meeting of the American Pulp and Paper Association to attend the Wednesday, February 23rd, broadcast of duPont's "Cavalcade of America" over the Columbia system. The feature of that evening will be "Noah Webster, the Nation's Schoolmaster."

Immediately following the broadcast the duPont sound film, "The Wonder World of Chemistry" will be presented. Passes for the occasion can be obtained either by writing to the various offices or from those representatives of the company who will be in New York for the Convention, February 21-25.

◆ GEORGE M. GRAVES, for twenty-five years purchasing manager of Bird and Son Inc., East Walpole, Mass., and since 1921 head of George W. Graves Company, paper mill supply dealers, passed away January 9 after a brief illness. He is survived by his wife, two daughters and two brothers.

◆ British Calligraphy Shown in N. Y. Exhibit

Sponsored by the American Institute of Graphic Arts, America's first exhibition of Modern British Calligraphy opened late in January at the Architectural League, New York City, to continue for two weeks.

Except for a few examples by invited artists, the exhibition consists mainly of the work of England's leading calligraphic group—the London Society of Scribes and Illuminators. The collection represents every branch of writing, both formal and informal, on vellum, leather or paper as well as inscription lettering cut in wood, stone, copper and other metals. It includes written and illuminated manuscript books, framed illuminations, formal broadsides, official certificates, maps, posters, show-cards, bookplates, letterheads, medals, pedigree charts and alphabetic treatments.

◆ A. L. Bergstrom Now Chief Engineer at Timken

New executive engineer of the Timken Roller Bearing Company, Canton, Ohio, is A. L. Bergstrom, formerly chief works engineer of the company. Mr. Bergstrom, a graduate of the Royal Technical Institute of Sweden, succeeds Ernest Wooler in his new position. Mr. Wooler resigned recently. Mr. Bergstrom has been with the Timken company since 1929.

◆ Dixie-Vortex Opens Factory in South

The Dixie-Vortex Company, manufacturers of paper drinking cups and containers, recently opened a factory in Darlington, South Carolina, according to an announcement by A. R. Flowers, secretary of the Darlington Chamber of Commerce.

The company has secured a modern factory building and the new plant will serve the trade in the Southeastern States. This new factory is one of the two being opened at this time to provide for expansion. Announcement was made about two months ago of another plant at Los Angeles. The company already has plants at Chicago, Easton, Pa., and Toronto, Canada.

◆ Cleveland Scene of N. I. A. A. Convention

Cleveland, Ohio, will be the scene of the 16th annual conference of the National Industrial Advertisers Association when that body convenes September 21-23, it has been announced by Stanley Knisely, advertising manager of Republic Steel Corporation, who heads the committee for conference program and arrangements. Last September the association surpassed all its former attendance records with a registration of almost 800 at the Edgewater Beach Hotel in Chicago.

Typical of some of the association's national committee activities was the recent development of publishers forms for three classifications of business papers, developed to provide more detailed and comparable data for space buyers and including editorial, or qualitative information, as well as additional industrial coverage and circulation data.

"Few plans are being made for the 1938 conference program," Mr. Knisely said, "until a canvass of the membership indicates what subjects it will be most desirable to present and discuss at that time."

◆ Paper in Sheets Made by McCorkindale Machine

A well-known inventor and technician in paper circles, William P. McCorkindale, president of the McCorkindale Co., Holyoke, Mass., has recently patented a machine to make a great variety of papers in sheets. In completing his invention, Mr. McCorkindale has based his machine entirely on the suction principle for removal of water, thus eliminating the necessity for continuous wires and heavy press rolls. Finished samples of some of the new papers, developed in experimental stages, indicate a broad diversity in types of paper, finishes, watermarks and textures.

Development of the machine was begun in 1931. From an experimental machine producing a sheet of paper 8 by 12 inches, Mr. McCorkindale has recently completed a large machine capable of making a sheet of paper 22 by 34 inches.

◆ Austin Cary Forest

The Florida State Board of Control has named the University Forest, the Austin Cary Memorial Forest after the well-known forester who passed away April 28, 1936. This forest of 1 519 acres is along state highway 13, ten miles from Gainesville.

Austin Cary, famous for his "Manual for Northern Woodsmen" had been associated with forestry since 1892 and a member of the United States Forest Service from 1910-1935. Just prior to his death he had entered the commercial timber field as consultant.

The memorial planned by the Society of American Foresters will stand at the entrance of the forest. Professor H. S. Newins is chairman of the committee for the memorial and all donations should be forwarded to him at Gainesville.

◆ Brown Company Installs Dilts Hydrafiners

Delivery of two additional Hydrafiners from the Dilts Machine Works, Inc., of Fulton, N. Y., was received by the Brown Company, of Berlin, N. H., makers of high grade bleached and unbleached Kraft papers.

These two new units will augment the six that are already in use at the Brown Company plant. The company is purchasing the additional Hydrafiners to replace older types of equipment.

◆ Sell Space for Super Toronto Convention

Exhibit space is already on sale for the Toronto Convention of the American Pulp and Paper Mill Superintendents' Association, to be held June 22, 23 and 24 at the Royal York Hotel, and opportunity is being offered those firms which exhibited at the 1937 meet to make first selection of space before the offer is opened to others.

Letters went out January 3 to 1937 exhibitors and the following spaces have been sold to date: Booth 1-2, Sandy Hill Iron and Brass Works, Hudson Falls, N. Y.; booths 4-5, Johns-Manville Co., New York; booths 9-10, International

Nickel Co., New York; booth 16, Barrett-Cravens Co., Chicago; booth 17, Paper Makers Importing Co., Easton, Pa.; booths 39-40, Nash Engineering Co., South Norwalk, Conn.; booth 41, J. O. Ross Engineering Corp., New York; booths 42-43, Beloit Iron Works, Beloit, Wis.; booth 44, Sturtevant Mill Co., Boston; and booth 45, Duriron Co., Inc., Dayton, Ohio.

Information regarding customs regulations for the Toronto Convention is available from George W. Craigie, convention manager, 176 Mason Street, Cumberland Mills, Maine.

◆ Penn Fibreboard Bought by Southern Kraft

The plan, lands, water rights and all other property of the Penn Fibreboard Corp., located in Spring Garden Township, York County, Pa., has been purchased by the Southern Kraft Corporation, the deal having been made by execution of a mortgage of $600,000 to cover 24 non-negotiable promissory notes for $25,000 cash, without interest respectively payable April 1, 1938, and quarter-annually thereafter until all have matured.

Under the terms of the deed, seven tracts in Spring Garden will be transferred to Southern Kraft, including all buildings, paper machines, tools, beaters and all other equipment as well as the right to maintain and use water from a dam in the Little Codorus creek.

◆ GEORGE "WHITEY" ENGERT, sales representative of Dilts Machine Works, Inc., is making satisfactory progress in the Saratoga Hospital, Saratoga Springs, N. Y., following his recent injury. Mr. Engert was struck by a passing automobile December 21, while changing a tire on his own car. He has been confined to the hospital since the accident and while his injuries have been painful he is considered out of danger.

◆ Asten-Hill Calendar

Novel in appearance and designed for more practicable usage, the new 1938 calendar of the Asten-Hill Manufacturing Company has been released lately to the general trade. The calendar departs from the orthodox rectangular or square style and is circular in shape, each sheet containing not only the current month but each month in the year as well. Those interested in obtaining one of these attractive calendars may do so by writing the Asten-Hill Manufacturing Company, Scott's Lane, (East Falls), Philadelphia, Pa.

◆ Oliver United Filters Has 30th Anniversary

In celebration of its thirty years in the filtration business, Oliver United Filters, Inc., gave a supper-dance, January 10, at the Hotel Leamington, Oakland, Calif., at which time special recognition was given to 109 employees who have been with the company ten years or more.

Representatives from the New York, Chicago and San Francisco sales offices, as well as from the Hazelton, Pa., and Oakland, Calif., factories were present. Speeches were made by E. L. Oliver, president and general manager, and E. J. Sweetland, chairman of the board of directors, as well as by other executives of the company. Mr. Oliver was the founder of the Oliver Continuous Filter Company and Mr. Sweetland was president of United Filters Corp. These latter two companies merged in 1928 to become the present Oliver United Filters, Inc.

◆ John H. Holzbog Given Public Service Award

In recognition for his services in promoting industrial safety, John H. Holzbog, personnel director of Chain Belt Company, Milwaukee. Wis., was recipient of the Milwaukee Junior Chamber of Commerce Distinguished Service Award at the January meeting of the Junior Chamber. These awards are made to men in local communities, under 36 years of age, who, during the year, have made outstanding public service contributions.

◆ Goodrich Twenty-Year Men Receive Service Emblems

Emblems representing 20 years of service with the B. F. Goodrich Company, Akron, Ohio, were presented to 120 employees recently, thereby increasing the enrollment of the Twenty-Year Service club to 1,818. Honors were also accorded 10 others in the nation-wide field organization who had completed one-fifth of a century of service with the company since last June. Vice-President T. G. Graham presented the pins in the absence of President S. B. Robertson, who was confined to his home with a cold.

◆ George P. Berkey

Vice-president of the Crown-Zellerbach Corporation, George P. Berkey, passed away recently at his home in Green Hills, Portland, Ore., at the age of 54. His death was attributed to a sudden heart attack.

Born in Fargo, N. D., and a graduate of Yale, class of 1906, Mr. Berkey was, in his early years, vice-president and general manager of the Consolidated Water Power and Paper Co., Wisconsin Rapids, Wis. In 1927 he became vice-president of the Crown-Willamette Paper Co. and later, vice-president of the Crown-Zellerbach Corporation. He was in charge of all operations of the latter corporation in the Pacific Northwest at the time of his death.

Surviving Mr. Berkey are his widow, two sons and a daughter.

◆ Crystal Tissue Co. Expands Facilities

The Crystal Tissue Co., Middletown, Ohio, is planning an expansion program for 1938 which will involve the expenditure of over $150,000. The program will consist of the erection of a new turbine room in which all the prime movers in the mill will be installed.

A new k-w General Electric turbo-generator has been purchased which will supply alternating current to the various mill motors while a motor generator set will supply direct current. These new generators will replace several smaller a-c and d-c generators and engines. One cylinder machine will be improved by the installation of a rubber covered suction press and a new beater has been installed in the mill. In addition, a new Intaglio printing machine has been installed in the converting mill.

◆ Hinman Now President of Canadian International

John H. Hinman, vice-president and general manager of the Canadian International Paper Company, has been elected president of the company to succeed R. J. Cullen; a move understood to be a further step in the process of decentralization of the International Paper and Power Company, which has been its objective ever since Mr. Cullen became president of the company.

Mr. Hinman was graduated from Dartmouth College in 1908 and entered the employ of the International Paper Company in 1912, taking charge of all woodlands operations in Northern New Hampshire and Vermont. In 1927 he became identified with the woods operations of the Canadian International Paper Co. and in 1936 he was appointed general manager of the company and its subsidiaries.

◆ St. Regis Paper Co. Re-Elects Directors

The St. Regis Paper Company held its annual meeting of stockholders January 12 and the following were re-elected directors of the company for the ensuing year: Jonathan Bulkley, F. L. Carlisle, W. K. Dick, R. K. Ferguson, H. E. Machold, R. B. Maltby, C. B. Martin, C. R. McMillen, C. E. Norris and B. B. Taggart.

R. K. Ferguson, president of the company, presided at the meeting and reviewed the company's operations during the past year, discussing generally the conditions prevailing in the pulp and paper industry. "Obviously," Mr. Ferguson said "our final figures are not ready as the auditors have not yet finished their report. Nevertheless, based on preliminary estimates the consolidated net earnings of the company and subsidiaries are expected to be almost double those of the previous year."

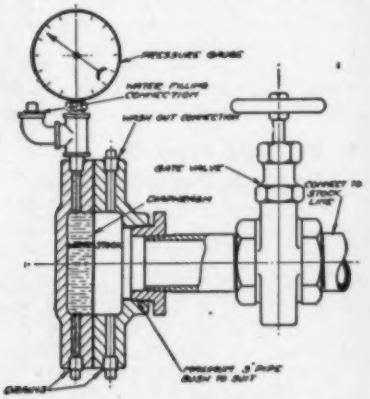
◆ J. H. MITCHELL-ROBERTS, export manager for Oliver United Filters, Inc., left Manila on January 14 for Melbourne, Australia, where he will spend several months with the company's agent, Crossle & Duff Pty., Ltd. Mr. Roberts has been in the Philippines since early in 1937, covering from that point, the company's interests in these Islands and adjacent countries.

◆ ALFRED E. TROETSCHER, superintendent of the sulphate mill at the St. Helens Pulp and Paper Co., St. Helens, Oregon, passed away January 7 in Portland. Mr. Troetscher held a similar position at the Crown Willamette Paper Co., Camas, Wash., until last spring.

◆ Stock Line Gauge Connection

Goulds Pumps, Inc., Seneca Falls, N. Y., has announced a diaphragm type pressure gauge connection for use on stock lines or other lines conveying fibrous material

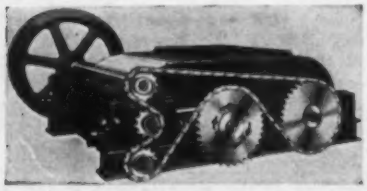
in liquid suspension. The connection, designated as Fig. 3110 Diaphragm Connection consists of two recessed circular flanges with a thin flexible diaphragm between them. One flange is tapped for a 3-in. pipe connection, and can be attached through nipples and gate valve to the stock line or other pipe. A tee and



filling connection connects the other flange with the pressure gauge. The recessed area of the outer flange section is filled with water. This water transmits the pressure of the stock or fibre suspension on the other side of the diaphragm to the pressure gauge.

◆ Two-Roll Coal Crusher

A two-roll spring-relief coal crusher, known as Chain Drive Type "C", has been developed by Link-Belt Company, Chicago, Ill. Cut tooth wheels and a Silverlink roller chain form the driving



connection to both rolls from a crusher countershaft. The countershaft is mounted in anti-friction bearings; the roll shafts in heavy rigid bearings. One of the roll shafts is equipped with adjusting sleeves which are provided with relief springs. The rolls are of the segmental type, having cast iron spiders to which are bolted heavy alloy iron segments, heat treated to a Brinnell hardness of from 500 to 600; and are 26 in., 30 in. and 36 in. in diameter, depending upon the size of crusher.

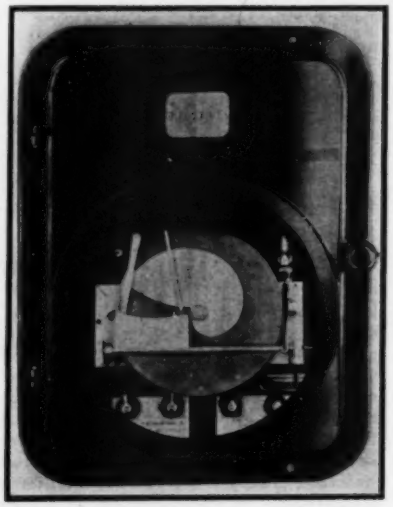
◆ Opacity Tester

The Republic Chemical Machinery Co., 154 Nassau St., New York, N. Y., has announced the development of a device for the measurement of the opacity of paper as well as other sheet films. The device, operated from any 110 volt circuit, consists essentially of a reflector box containing a lamp-bank of high wattage output and in the circuit of which is a variable resistor; a cover panel for the box; a lens; a photocell wired to a resistance coupled voltage amplifier; and a voltmeter which i hooked in parallel across the lamp-bank.

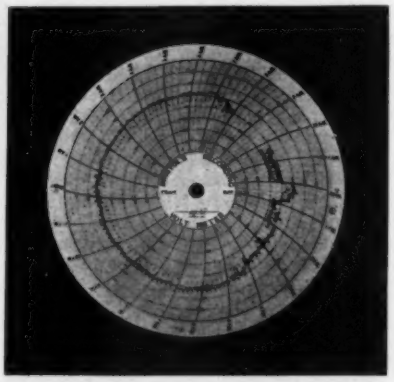
In the operation of the device, a sample of the paper or other material to be tested is tightened over a hole in the cover panel. Then the cover panel is placed in position over the reflector box and the intensity of light raised by gradually reducing the resistance in the lamp-bank circuit, the lens focusing all of the penetrating light upon the cathode of the photocell. The photocell, when sufficiently activated, produces a signal which the amplifier is capable of building up to a bias of minus seven volts. This bias is delivered to the grid of the cathode ray tube. Upon reception of the bias, the shadow in the cathode ray tube, which under normal operating condition is wired to a spread of a 90 deg. angle, is closed to a 0 deg. angle. Since the quantity of light necessary to produce a complete closing of the shadow in the cathode ray tube is a constant, and since the voltage across the lamp-bank is related directly to the intensity of light emitted by the lamp-bank and brought to bear upon the test sample, an indirect but precise measurement of the transmission value of the test sample is indicated by the voltmeter.

◆ Device for Recording Remote Measurement of Electrical Units

The Bristol Company, Waterbury, Connecticut has announced an instrument for recording the measurement of electrical



units, such as volts, amperes, and watts, at remote distances. A cam, diven by a constant speed motor, gives the electrical impulses required to operate the



system. The device, designated as the Metameter, is designed so that no strain is placed on the measuring element as the pointer arm is periodically engaged and released.

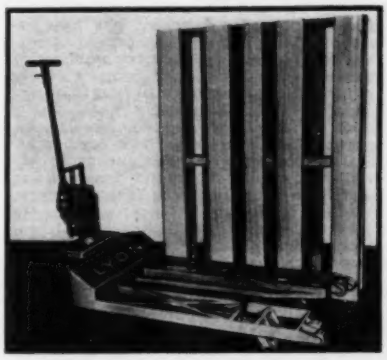
◆ Handy Knife

Stanley Tools, New Britain, Conn., has announced a knife, the No. 1299 "Keen-Knife," which has been designed for work requiring a tool of razor edge keen-

ness. The handle is cast iron. It is perforated for lightness and good grip. A compartment is provided within it for extra razor type blades. Five blades are furnished with each knife.

◆ Hydraulic Lift Truck for Pallets

A hand-operated, hydraulic lift truck, designed primarily for the handling of double-faced pallets, has been announced by Lyon Iron Works, Greene, N. Y. This design of truck makes use of two sets of rollers on the rear end of its platform to facilitate pallet entrance and requires a pallet with a rear opening in its bottom face of a width sufficient to allow the rear wheels of the truck to drop through for floor contact. In this position, the pallet is raised off the floor



through the hydraulic elevating mechanism by pumping on the truck handle.

The model lift truck, as illustrated, has a capacity of 4,000 lb.; a lowered height of 3¼ in. with 3 in. elevation; and a U-shaped carrying platform with an overall length, including the rollers, of 48 in. and a width of 30 in. This size of truck was designed for use with pallets 48 in. long by 36 in. to 60 in. wide, with end boards 6 in. wide, and with a minimum wheel opening of 6½ in. The top and bottom boards can be made of lumber ¾ in. thick up to 1⅛ in. thick; while the openings between the top and bottom boards should be 3¾ in.

The truck can be furnished in other sizes as well as for pallets of other specifications.

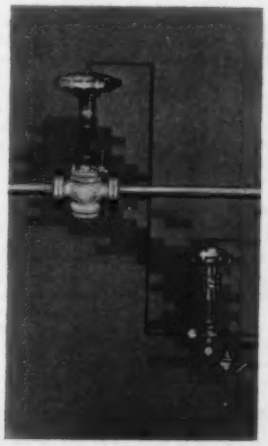
◆ Non-Glare Liquid Adhesive

The Skybryte Company, Cleveland, Ohio, has announced a product for window application to reduce glare within a building caused by snow. The product, designated as Snopake, is a pale-green adhesive liquid. It can be applied with brush or spray gun to either the inside or outside of a window and remains on the glass until removed with hot water and stiff bristle brush. The manufacturer reports that it admits over 90 per cent of the light, yet reduces it to mellow soft-diffused illumination.

◆ Pressure Controller

A pressure controller, known as the Syncromaster Pressure Controller, has been developed by Mason-Neilan Regulator Co., Boston, Mass. It is a hydraulic operated combination of pilot mechanism and a diaphragm actuated control valve. Pilot construction features include self-aligning spring buttons; thrust ball bearing of stainless steel; stainless steel ball bearing guides; lap-type piston valve of 18-8 stainless steel; and multiple springs. The pilot may be mounted on wall or panel or directly on the control valve. Control valve features include ball bearing guides; all parts subject to friction and corrosion of 18-8 stainless steel;

streamlined parobolic centroguide valve plugs; and pressure lubricator. Either normally open or normally closed valves may be used. The controller is available in a variety of standard pressure ranges between 1 and 265 lb. and in special ranges up to 750 lb. Equipment for dif-



ferential pressure service up to 1500 lb. static pressure may also be furnished.

Typical applications include primary and auxiliary steam lines; heating and evaporating systems; turbine or bleeder make-up systems; desuperheating service; differential pressure systems; and pump regulation.

◆ Waterproofing Material for Concrete

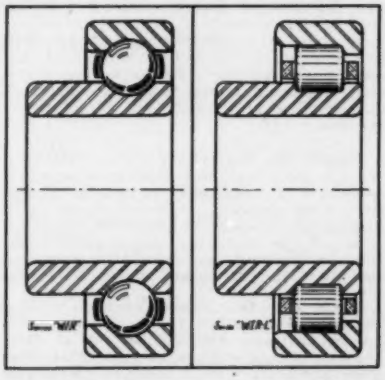
A liquid waterproofing material for concrete, known as Flextite, has been developed by Flexrock Company, 800 North Delaware Avenue, Philadelphia, Pa. This product, when mixed with Portland cement, may be used to plaster a concrete surface or it may be employed to seal cracks or openings in concrete structures. According to the manufacturer, the paste will set in thirty seconds; will stop a leak against hydrostatic pressure; and will make a permanent repair.

◆ Filler Insulation for Underground Steam Lines

A new application for fibrous glass manufactured by the Corning Glass Works, Corning, N. Y., has been developed by the American District Steam Company, North Tonawanda, N. Y., for the insulation of underground steam lines. The material, known as Adsco-Corning filler insulation, is composed of long, flexible fibers of true glass in a soft, resilient mass resembling cotton batting but possessing the permanence and chemical characteristics inherent in glass. It is packed in strong paper bags at a density which is suitable for maintaining a thermal efficiency for pipe lines operating at a mean temperature of 650 deg. Fahr., or it can be supplied for higher temperatures where required.

◆ New Bearing Types

Norma-Hoffmann Bearings Corporation, Stamford, Conn., is supplying two new types of Precision Bearings—the WIR Series of ball bearings and the WIR-L Series of roller bearings. The distinctive feature of both of these new types of bearings is the use of a wide inner ring of double-row bearing width in combination with an outer ring of single-row



width. The wide inner ring, according to the manufacturer, insures a better sealing on the shaft than the standard single-row ring, and, in many cases, avoids the necessity for threading the shaft and applying lock nuts or other locking devices. Bores of the WIR Series are from 25 to 55 mm.; while those of the WIR-L Series with one-lipped outer ring are from 30 to 130 mm.

◆ Air Line Freeze Preventive

Sullivan Machinery Company, Michigan City, Ind., has announced an air line and air tool freeze preventative that has been developed particularly for industrial applications and wherever electric current is available for its operation. In operation the material, known as Frosto, is vaporized and fed into the compressed air line near the compressor. The manufacturer states that current consumption is small and thermostatically controlled, and that only about a quart of Frosto is required to treat 100,000 cubic feet of free air under the worst conditions of temperature and humidity.

◆ New Catalogues and Publications

Alvey-Ferguson Co., Cincinnati, Ohio—An attractive new catalogue, describing this company's various types of gravity conveyors, has recently been issued. The edition contains many photographs of the conveyors in actual use and in addition explains the construction and usage by means of blue-print drawings and concisely-written material. It is punched for loose-leaf filing.

American-Marsh Pumps, Inc., Battle Creek, Mich.—This company has recently issued a folder describing the construction and installation of its deep well centrifugal pumps for industrial service.

American Writing Paper Corp., Holyoke, Mass.—As a sales aid for the printer, this company has recently issued Letterhead Sketch Kit No. 2; a portfolio containing twelve letterhead designs each on a double letterhead sheet of Eagle-A Trojan Bond. On the inside of this handy portfolio are guide lines to enable the printer to fill in with a pencil or brush the wording of the prospective customers' letterheading. In addition to the latter item, the company has also published a beautiful folder featuring Eagle-A Leonardo, a new deckle-edged advertising paper. In naming the sheet the makers paid tribute to Leonardo da Vinci, whose famous Mona Lisa is reproduced in the folder.

Association of Consulting Chemists and Chemical Engineers, Inc., New York, N. Y.—This organization has recently issued its new 1938 directory (4th Edition) of members of the association. In addition to the usual data expected in a directory, this edition contains valuable details about the work these leading consultants are especially prepared to undertake. Copies of the directory may be obtained gratis upon request.

Bristol Co., Waterbury, Conn.—Recorders for electrical unit measurements are described in a new bulletin now available from this company. Included in the well-illustrated, 22-page bulletin, are descriptions of the operating characteristics of these instruments and their various applications in the utility and industrial fields.

Chain Belt Co., Milwaukee, Wis.—This company publication, *The Rex World,* ordinarily features the application of Rex chains and conveyors in various industries. This particular issue, however, contains pictures of the company plant and operations. Described as the Craftmanship Issue, this publication presents, by means of rotogravure style pictures, the various ramifications of a metal working plant.

Cincinnati Rubber Mfg. Co., Cincinnati, Ohio—Spiral bound and containing complete descriptions and illustrations of the company's transmission belting, conveyor belting and various types of industrial rubber hose, this new catalogue is so made up as to be a valuable reference in any industrial library. Detailed reading matter regarding the construction and uses of the products, together with cross-sectional drawings, specification tables and index are included in the publication.

Clark Controller Co., Cleveland, Ohio—An interesting new publication is *The Contractor;* premier house organ of this company. In addition to presenting some of the company's controlling devices, the issue depicts, in a friendly, informal manner, some of the company's activities and personnel set-up. An interesting article illustrates, in a genealogical manner, the 61 family groups employed at the company.

E. I. duPont de Nemours & Co., Wilmington, Del.—The first issue of the *Neoprene Notebook* has just been released by this company. This publication is planned to give the engineer and the manufacturer engineering information, laboratory data and application reports on neoprene so that he will have this material readily available when considering his next application. The publication presents many of the uses of the product, is illustrated and is punched for loose leaf filing. It will be published regularly and sent to those interested without charge.

Foote Bros. Gear and Machine Corp., Chicago, Ill.—A new 27-page bulletin dealing with agitator drives has recently been issued by this company. Replete with photographs, diagrams and specification tables, this release contains the complete picture of the construction and installation of the various agitator drives, powered gears and speed reducers manufactured by the concern.

B. F. Goodrich Co., Akron, Ohio—The extending uses of rubber is the theme of a paper recently compiled by J. W. Schade, director of research at the Goodrich company, and now available to those interested. This interesting manuscript, 12 pages in length, presents many of the uses of rubber in modern industry and reveals a considerable number of little-known uses of the material.

D. W. Haering & Co., Inc., Chicago, Ill.—This company has just issued the second edition of *Organic Methods of Scale and Corrosion Control;* a complete technical exposition of the application of organic chemistry in this field. The booklet is profusely illustrated with graphs, formulae and equations of interest to the chemist and engineer responsible for scale or corrosion control in industrial operations. It contains much information on the glucoside derivatives and fundamental principles of organic chemistry involved in scale and corrosion processes.

Hancock Valve Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—This company has recently released the first bulletin ever printed describing the company's new blow-off valve with the "Blo-Deflector" protecting lip. The design and operation of the product are explained by cross-sectional illustrations and concise written material, in addition to specification tables.

Howard Iron Works, Alberger Heater Co., Buffalo, N. Y.—An interesting and attractive new bulletin which has to do with the various types of industrial heaters manufactured by the firm, has been released lately. The bulletin contains many photographs which, together with the explanatory literature, dimensional and capacity tables, and sectional drawings, serve to give the reader the complete picture of both the construction and installation of the product. Included in the publication is an alignment chart to determine the correct sizes of openings, pipe lines, etc.

Leader Iron Works, Inc., Decatur, Ill.—A new bulletin recently issued by this company presents a picture of the kind and scope of steel fabrication handled in the company's shops in the manufacture of various special kinds of equipment including tanks, cookers, condensers, digesters, agitators, kettles, etc. The bulletin illustrates the type of equipment manufactured by means of explanatory written material and photographs, which point out the features of the product.

Metallizing Engineering Co., Inc., New York, N. Y.—Of interest to all plant executives and engineers is the recent bulletin put out by this company discussing the relation of metal sprayed surfaces to lubrication. The booklet, a compilation of data by Harry Shaw, consulting and research engineer, shows the results of tests made in relation to the behavior of metal sprayed surfaces from the standpoint of lubrication.

Morris Machine Works, Baldwinsville, N. Y.—A bulletin describing a unique type of centrifugal pump for handling large capacities at low heads has just been published by this company. The bulletin describes these pumps in detail with exterior views, sectional drawings and dimensions of both horizontal and vertical types.

Pulverizing Machinery Co., Roselle Park, N. J.—A new catalogue just put out by this company gives a complete picture of the various types of pulverizers manufactured by the company. The catalogue contains, among other informative material, 28 installations photographs of pulverizing operations in various industries, 14 illustrations of the product and tables of capacities and power consumption.

Shafer Bearing Corp., Chicago, Ill.—A de luxe style catalogue (No. 14) explaining the adaptation and construction of the radial-thrust roller bearings and self-aligning ball and roller bearing units manufactured by this company, has been released lately by the concern. Comprehensive in scope, this new publication presents a most complete picture of the products. It is filled with illustrations and contains much engineering data, all of which is carefully and completely presented. Tables and drawings further aid the written material in presenting the product. A separate booklet, inserted in a handy compartment on the back cover, contains the price lists.

Swartwout Co., Cleveland, Ohio—This company has just issued a new bulletin (No. 205) describing the company's rotary ball bearing ventilator. The bulletin shows the construction and operation of the ventilator by means of numerous drawings, from every angle, and by detailed literature. There are many installation views of the product. The publication, which is punched for loose-leaf filing, is written in a clear manner and explains every conceivable point regarding all phases of construction and usage.

BOOKS

Check Sheet-Introduction of New Industrial Products (Revised)—In order to assist the efficient introduction of new industrial products and to reduce to a minimum, avoidable economic waste in marketing, the Marketing Research Division, Bureau of Foreign and Domestic Commerce, has just revised and made available a new edition of a check list which enumerates procedures to be employed when introducing a new product to the market. The publication, fifty-three pages in length, incorporates practically all of the fundamental considerations that must be answered with real knowledge if the problems of introducing and establishing a new industrial product are to be given intelligent consideration and failure avoided. There is a check sheet devoted to direct marketing problems and one devoted to problems concerning the origination and production of a new industrial product. Each of the check sheets is so constructed that the user has a wide list of problems which must be solved for the successful marketing of new industrial merchandise. These problems, which show in the stubs, are checked against the various angles in which they will be considered in order to insure that no important question is overlooked. In the text of the book a section is devoted to a detailed explanation with examples of use for each section shown on the check sheet. The publication, further identified as Market Research Series No. 6, may be purchased for ten cents from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or from any of the district offices of the Bureau located in the principal cities of the United States.

Addressbuch Der Papier-, Pappen-U. Papierstoffabriken Deutschands und Seiner Nachbarstaaten (Directory of the Paper, Board and Pulp Mills of Germany and Neighboring States)—The 26th edition (1937/38) of this well known German biennial publication has made its appearance. Bound attractively in blue cloth cover, the book is a work of 695 pages which presents

pertinent information on the mills of Germany, Belgium, Denmark, Alsace-Lorraine, Estonia, Jugoslavia, Lettland, Lithuania, Luxembourg, Netherlands, Austria, Poland, Switzerland and Hungary. The mills of Germany are arranged alphabetically according to states and locations within the states, while the other mills are grouped as to countries and then alphabetically as to location within each country. There also is information on trade associations, trade customs, watermarks, and trade names. The section on watermarks is illustrated. A further listing of mills according to manufactured products and a reference guide to manufacturers of mill equipment completes the volume. Guntter-Staib Verlag, Biberach a. d. Riss, Wurttemberg is the publisher; and the price is 10 RM per copy.

Books and Documents—The Chemical Publishing Co. of N. Y., Inc., 148 Lafayette Street, New York, N. Y., has recently issued "Books and Documents," a very inviting book for any one interested in the subject of papermaking and in the use of paper for the making of books. The author, Julius Grant, Ph. D., M. Sc., F. I. C., a well-known British technologist, separates his work into two major parts. The first part treats of the dating of books and documents; and includes individual chapters on The History of Paper-Making, Dating Evidence from Paper, Dating Evidence from Ink and Other Sources, Experimental Dating Tests, and Fluorescence in Ultra-Violet Light as a Simple Aid to the Dating and Examination of Books and Documents. Part II discusses the permanence and preservation of books and documents. Its chapter headings are: The Nature of the Problem; Paper-Making, From the Point of View of Permanence; Ink Manufacture, From the Point of View of Permanence; Tests for the Permanence of Paper and Ink; The Influence of Light, Heat and Air on Permanence; The Permanence of Bindings; The Selection and Specification of Permanent Paper and Inks; and Permanent Records: Methods of the Future. Each chapter with the exception of the chapter on The History of Paper-Making and that on The Nature of the Problem is concluded with a number of reading references. The book is nicely illustrated and well indexed; and is priced at $4.50 per copy.

Latex and Rubber Derivatives and Their Industrial Applications (Vol. II and III)—These volumes, only recently released, are companion and supplementary publications to LATEX AND ITS INDUSTRIAL APPLICATIONS, a book issued in 1933, and are the work of the same author, Frederick Marchionna. The three volumes constitute a monumental bibliography, the latter two volumes covering in 22 chapters a bibliography of patents and published literature on latex and rubber derivatives from July, 1932 to January, 1937. Abstracts to patents include those issued in the United States, England, France and Germany; while literature citations cover an unusually large number of technical journals. Several of the chapters are individually introduced with a specially contributed article. The introduction to the chapter on Paper and Artificial Leather Manufacture is a joint contribution on the subject by George A. Richter and M. O. Schur, both of the Brown Company. Following the bibliography in Volume III is an author index, an index of patentees, an index of patents arranged by countries, and a subject index. The page size is 6" x 9". Not sold separately, the two volumes, totaling about 1700 pages, are priced at $20.00 by the publisher, The Rubber Age, 250 West 57th Street, New York, N. Y.

Modern Refractory Practice (Second Edition)—Harbison-Walker Refractories Company, Pittsburgh, Pa., published this book during 1937. It is an attractively bound book of 296 pages. Included in these pages, each 7¾" x 10¾", are 52 illustrations and 97 charts and tables. While the book follows the general lines of the first edition (1929), it has been completely rewritten and increased considerably in size. One chapter is devoted to suggestions regarding the selection, care and use of refractories; another includes basic technical data on the composition, structure, and properties of refractories as affected by furnace temperatures, furnace gases, and slags. There also is a glossary of terms, a selected list of minerals and rocks, and a compendium of formulas and tables, each of significance to any one concerned with refractories. All in all, the volume serves both as a technical reference work and as a complete catalogue of Harbison-Walker products. The price of the book is $2.50; but it is offered without charge to users of refractories.

National Directory of the Canadian Pulp and Paper Industries (1938)—Latest available statistics on the pulp and paper and allied industries of Canada, and information on the manufacturers of pulp, paper and board, and on converters are contained in this recently issued volume. The chapter headings, indicative of the information covered by them, include: The Pulp and Paper Industry in Canada in 1936; Forest Resources of Canada; Water Power in the Pulp and Paper Industry; The Canadian Pulp and Paper Association; The Pulp and Paper Mills of Canada and Newfoundland; Converters of Paper in the Dominion of Canada; List of the Paper Mills of Canada and Newfoundland (classified according to products); Pulp and Paper Distributors; Manufacturers of Paper Products (classified by kinds); Rag and Paper Stock Dealers; Pulp, Paper and Allied Organizations; Department of Mines & Resources; and Forest Protective Associations. Its publisher is National Business Publications, Ltd., Gardenvale, Que.; its editor, J. N. Stephenson. The price is $3.00 per copy.

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Sight feed and hand force feed oiler; wrenches, spanners, etc., go with it. Descriptive circular, instruction booklet and blue prints for foundations included. Two semi-circular belt guards will be included if purchaser wants them. It is rated for speeds from 300 r.p.m. to 350 r.p.m. Maximum safety load 40 h.p. or 25 K.W. This engine was installed for emergency use. Perhaps was not run to equivalent of six months' use.

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2—300 hp Wgse. 360 rpm	1—150 hp Wgse. 900 rpm	1—300 kw Syn. Compl.
1—200 hp G. E. 600 rpm	1—150 hp Al. Ch. 1200 rpm	ENG.—GEN. SETS
1—200 hp Burke 900 rpm	1—150 hp Al. Ch. 720 rpm	1—225 KVA Busk.-Al. Ch.
3—200 hp Al. Ch. 720 rpm	1—125 hp G. E. 1800 rpm	1—150 Skinner-G. E.

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July 1, 1937 to June 30, 1938
Cumulative Scores as of December 31
19 Mills Have Perfect Record

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
A	Container Corp. of America	Philadelphia	Pennsylvania
B			
C	Strathmore Paper Company	Woronoco	Massachusetts
C	Finch Pruyn & Company, Inc.	Glens Falls	New York
D	The Harriman Company	Harriman	Tennessee
D	Bird & Son, Inc.	Phillipsdale	Rhode Island
D	Union Bag & Paper Corp.	Allen Paper Mill	Hudson Falls, N. Y.
D	United States Envelope Co.	Morgan Paper Co. Div.	Lititz, Pennsylvania
D	Spaulding Fibre Company, Inc.	Milton	New Hampshire
D	The Mead Corporation	Nashville	Tennessee
D	Rogers Fibre Company, Inc.	Bar Mills	Maine
D	Hollingsworth & Whitney Co.	Aroostook & Cobbossee Mills	Gardner, Maine
D	International Paper Co.	Riley No. 23	Riley, Maine
D	Alton Box Board Company	Carlyle	Illinois
D	Spaulding Fibre Co., Inc.	Hayes Plant	North Rochester, N. H.

Division II—Paper and Board Re-Manufacturing

Bird & Son, Inc.	Norwood	Massachusetts
Bird & Son, Inc.	Chicago	Illinois
Texas Corrugated Box Co.,Inc.	Dallas	Texas
Bemis Brothers Bag Co.	East Pepperell	Massachusetts
Bay West Paper Company	Green Bay	Wisconsin

IMPERFECT SCORES

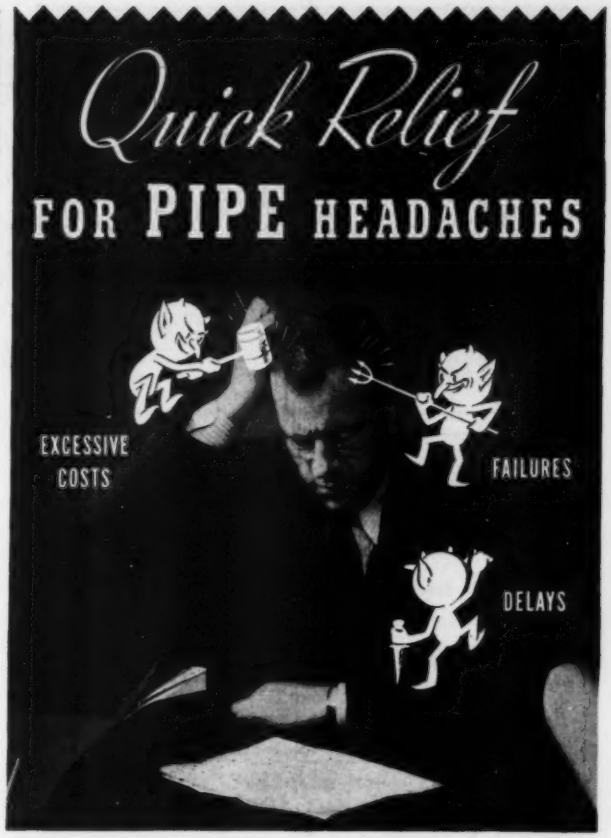
	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP A	P-139	2	2	2.149
	P-108	3	6	4.348
	P- 19	4	3	4.434
	P- 13	5	4	4.461
	P- 12	6	5	5.259
	P-121	7	5	5.593
	P- 84	8	6	5.867
	P- 1	9	11	6.821
	P- 18	10	10	7.790
	P- 28	11	19	7.886
	P- 10	12	8	8.110
	P- 30	13	6	8.264
	P-136	14	7	8.368
	P- 21	15	7	8.406
	P- 69	16	9	9.388
	P-128	17	6	9.961
	P- 9	18	16	10.837
	P- 11	19	11	13.429
	P- 62	20	15	13.650
	P- 23	21	9	13.828
	P- 2	22	9	14.835
	P-102	23	14	15.351
	P-107	24	10	15.682
	P- 27	25	43	15.684
	P- 73	26	26	17.631
	P- 64	27	15	17.847
	P- 67	28	28	19.257
	P- 40	29	25	24.393
	P- 87	30	34	28.780
	P- 32	31	31	38.179
	P-140	32	36	41.831
	P- 71	33	35	45.099
	P-114	Withdrawn—Reports Missing.		
GROUP B	P- 4	1	1	2.386
	P- 68	2	2	3.445
	P- 22	3	2	3.512
	P-135	4	2	4.132
	P-133	5	4	7.407
	P- 72	6	3	7.519
	P- 58	7	4	7.709
	P- 70	8	4	8.140
	P- 97	9	5	8.884
	P-142	10	4	9.195
	P- 60	11	5	9.414
	P-143	12	4	9.843
	P- 59	13	5	10.608
	P-122	14	6	11.380
	P-112	15	8	14.067
	P- 45	16	7	15.421
	P- 15	17	9	19.077
	P- 46	18	7	19.337
	P- 26	19	9	20.341
	P- 16	20	9	20.377
	P- 3	21	12	21.945
	P-124	22	11	22.476
	P-123	23	11	22.657
	P-120	24	13	23.320
	P- 25	25	11	23.340
	P-137	26	11	25.367
	P-130	27	13	27.463
	P- 82	28	17	31.369
	P-104	29	20	46.086

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP C	P- 55	3	1	2.922
	P- 43	4	1	4.625
	P- 88	5	4	12.278
	P- 37	6	3	12.882
	P-119	7	5	14.553
	P-113	8	3	15.161
	P- 61	9	5	17.675
	P-116	10	4	21.979
	P- 52	11	6	22.485
	P- 94	12	5	24.066
	P- 33	13	6	25.971
	P- 47	14	6	27.279
	P- 14	15	5	27.457
	P- 17	16	6	29.776
	P-103	17	6	30.365
	P- 29	18	8	34.050
	P- 41	19	13	39.262
	P-111	20	10	40.331
	P- 48	21	8	40.603
	P- 34	22	12	57.121
	P- 80	23	15	66.072
GROUP D	P-129	12	1	7.136
	P- 42	13	1	9.087
	P- 93	14	1	10.587
	P-125	15	1	12.054
	P-141	16	1	12.876
	P- 50	17	2	13.242
	P- 35	18	1	14.688
	P- 49	19	2	15.477
	P- 6	20	3	19.858
	P- 91	21	3	19.911
	P-106	22	3	21.540
	P- 99	23	2	21.559
	P-110	24	1	21.572
	P- 38	25	3	28.320
	P-134	26	4	30.072
	P-138	27	4	30.330
	P- 7	28	5	33.336
	P- 63	29	5	35.250
	P- 81	30	5	35.333
	P- 65	31	3	37.410
	P- 98	32	4	37.450
	P- 36	33	3	47.441
	P-131	34	5	80.292

Division II—Paper and Board Re-Manufacturing

R-23	6	1	2.122
R-20	7	2	3.817
R-19	8	1	5.387
R-13	9	1	5.776
R-21	10	3	8.988
R-28	11	3	10.855
R-10	12	3	11.708
R- 5	13	7	13.488
R-27	14	3	16.227
R-11	15	1	18.413
R-24	16	7	24.775
R- 9	17	4	29.952
R- 1	18	9	31.143
R-22	19	2	34.667
R-26	20	9	44.390
R- 4	21	4	80.172
R-25	Withdrawn—Reports Missing.		

December Report Missing—Covers five months only:
P-26, P-25, P-130, P-27, P-113, P-33, P-34, P-35, P-36, P-38, P-131.
Finch Pruyn & Co., Inc., Glens Falls, N. Y.; Alton Box Board Co., Carlyle, Ill.; Bemis Brothers Bag Co., East Pepperell, Mass.; Bay West Paper Co., Green Bay, Wis.



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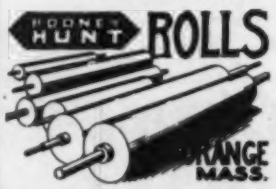

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◆ TAPPI Medal Award to C. B. Thorne

The medal awarded by the Technical Association of the Pulp and Paper Industry to an individual who has made outstanding contributions to the technical advance of the pulp and paper industry will be presented on February 23rd at the annual luncheon of TAPPI, to Carl B. Thorne. Vice President of the Canadian International Paper Company. Dr. Thorne was born at Moss, Norway, and studied both mechanical and chemical engineering at Hanover and Dresden Universities in Germany.

On leaving university he immediately became associated with sulphite pulp manufacture and worked for a number of years as both chemist and engineer in various sulphite mills in Germany and Norway.

In 1902 he came to this continent to study the manufacture of paper and in the following year joined the staff of the Riordon Company as engineer and sulphite expert for their mills at Hawkesbury and Merritton. He was appointed manager of the Hawkesbury Mill in 1905 and later also took over the management of the Merritton mill. He designed and erected in Hawkesbury the first reinforced concrete towers for the manufacture of sulphurous acid. Other developments and contributions to the sulphite industry followed quickly, among which are an SO_2-reclaiming system, and a radically new and different type of log barking machine which will effectively remove the bark from logs of any length up to 16 feet or even longer. Perhaps his most important contribution to the pulp industry is his continuous and multiple stage bleaching systems. In addition, he has designed, developed and patented other machines now used in the cellulose industry, i.e., savealls, water filters, fiber loss indicators, etc.

In 1919 he planned, designed and built the Kipawa Mill together with its hydro-electric development. This was the first mill designed particularly for the manufacture of wood cellulose as a raw material for artificial silk. He also planned and built the town of Temiskaming, Quebec.

He has been knighted by King Haakon of Norway as Knight Commander of the Royal Norwegian Order of St. Olav. In 1936, Die Technische Hochschule, Darmstadt, conferred upon him the degree of Doctor Ingenieur honoris causa, and in 1937 he was appointed an Honorary Member of Papirindustriens Tekniske Forening, Norway.

Because of his world wide connections and activities in the cellulose industry he has been the means of promoting cordial commercial and technical cooperation between the pulp and paper associations in many countries.

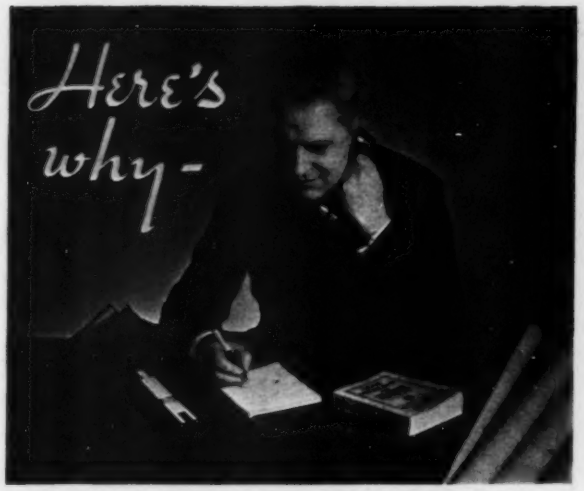
◆ Alfred P. Sloan Donates Large Sum to Safety

Twenty-five thousand dollars, the largest personal contribution ever made for the purpose of traffic safety, was announced recently by the National Safety Council as having been the donation of Alfred P. Sloan, chairman of the board of General Motors Corporation, to the Automotive Safety Foundation. The contribution, a tangible expression of Mr. Sloan's high personal regard for Paul G. Hoffman, president of the foundation, and for Mr. Hoffman's safety activities over a period of years, will be used by the foundation for additional and personal awards in the 1937 National Safety Contest which ended December 31.

Twelve police officers and eight traffic engineers will be selected from the prize-winning cities and states in the Council's contest and sent to Northwestern and Harvard Universities for a year's training in traffic safety. Each of these 20 policemen and engineers will be given $1,000 in cash plus the cost of a full year's tuition.

The purpose of the $25,000 contribution, as expressed by Mr. Sloan, is to foster progress in the safe and efficient use of streets and highways in four ways:

1. By encouraging states and cities in the use of scientific methods of traffic control and accident prevention.
2. By emphasizing the importance of using men trained in traffic engineering and enforcement.
3. By stimulation of training of men in these new and specialized professions.
4. By recognizing community achievement in traffic safety and efficiency by providing university training for their engineering and police personnel.



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◆ TAPPI Tentative Annual Meeting Program

The Technical Association of the Pulp and Paper Industry will hold its annual meeting at the Waldorf-Astoria Hotel, New York, February 21-24, 1938. Following are some of the papers to be presented:

"Economic and Technical Aspects of Wood Pulp as a World Commodity," by R. B. Wolf

"Reasonable Sanitary Standards for Paper Products," by J. R. Sanborn

"Container Standards," by J. D. Malcolmson

"The Corrugated Paper Crush Test," by Pierre Drewsen

"Requirements for the Packaging of Various Types of Foods," by C. A. Southwick Jr.

"Stock Leval and Pressure Recording Indicating and Control," by A. H. Stanton

"Sheet Forming Characteristics on Cylinder Machines," by Philip Goldsmith

"Further Studies in Wire Drainage," by H. G. Specht and C. M. Connor

"Alum, Its Use and Effects," by L. M. Booth

"Properties of Pigmented Papers," by W. R. Willets

"Chloramine Treatment for Slime Control," by R. B. Martin

"Further Studies in Waste Utilization," by L. M. Booth

"The Dual Press," by Beloit Iron Works

"A New Device for Applying Wires to the Fourdrinier Paper Machine," by Beloit Iron Works

"The Vortrap." by Horace Freeman

"Paper Machine Operating Costs," by J. P. Hagenauer

"Studies on the Disc Refiner," by D. M. Sutherland Jr.

"Beater Room Control," by W. F. Hoffman

"Defibering Ligno-Cellulose Materials at High Temperatures," by Arne Asplund

"Economic Factors of Refining," by TAPPI Stuff Preparation Committee

"Refining Operating Data," by A. S. Cosler

"Controlled Stock Preparation," by H. K. Williamson

"Operation Data on the Classifiner," by E. C. Cowles

"Digester Blowdown Condensing Systems," and the Recovery of Heat and Turpentine from Digestor Relief, by Pell Foster

"Discussion of the Accepted Methods of Chemical Control in Causticizing Plants," by R. P. Kite

"The Swenson Causticizing System," by W. F. Gillespie

"The Present Status of Air Conditioning Practice," by V. P. Victor

"A Resume of Moisture Control Systems," by the TAPPI Drying, Heating and Ventilating Committee

"Boiler Feed Water Treatment," by Sheppard T. Powell

"Proper Protection of Electrical Circuits in Pulp and Paper Mills," by H. A. Travers

"Sorption of Water Vapor by Papermaking Materials," by C. O. Seborg

"Solubility of Chlorinated Lignin in Alkaline Solutions," by G. C. Arnold, F. A. Simmonds and C. E. Curran.

"A Reflectance Method for the Determination of the Rate of Discoloration of Papers and its Application to the Study of Artificial Aging of Sulphate Papers," by J. C. Tongren

"A Photographic Study of the Motion of Fibers and Water in Flowing Fiber Suspensions," by E. O. Bryant and L. A. Moss

"Effect of Digestion on Wood Structure," by A. L. M. Bixler

"A Case Study of Technical Control in a Paperboard Mill," by J. H. Allen

"A Survey of Quality Control and Inspection in Paper Mills," by L. T. Stevenson

"Effects of Impurities and Alkalinity on the Stability of Calcium Hypochlorite," by C. M. Connor

"The Time Cycle Chart in Bleach Plant Design," by W. L. Savell

"The Use of Caustic Soda in the Bleaching of Pulp," by T. W. Toovey and B. L. Shera

"Survey of Corrosion in Kraft Pulp Mills," by TAPPI Materials of Construction Committee

"Characteristics of Sulphite and Kraft Pulps from Blue Stained Southern Pine," by G. H. Chidester, M. W. Bray and C. E. Curran

"Comparison of Sulphite Pulps from Fast Growth Loblolly, Shortleaf, Longleaf and Slash Pines," by G. H. Chidester and J. N. McGovern

"Symposium on Testing the Printing Smoothness of Paper," by TAPPI Paper Testing Committee

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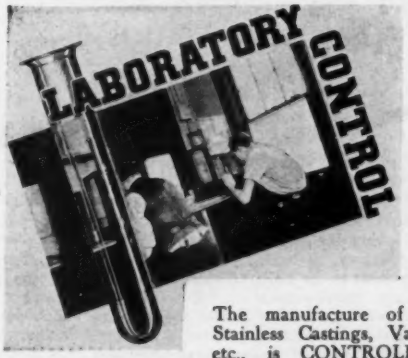

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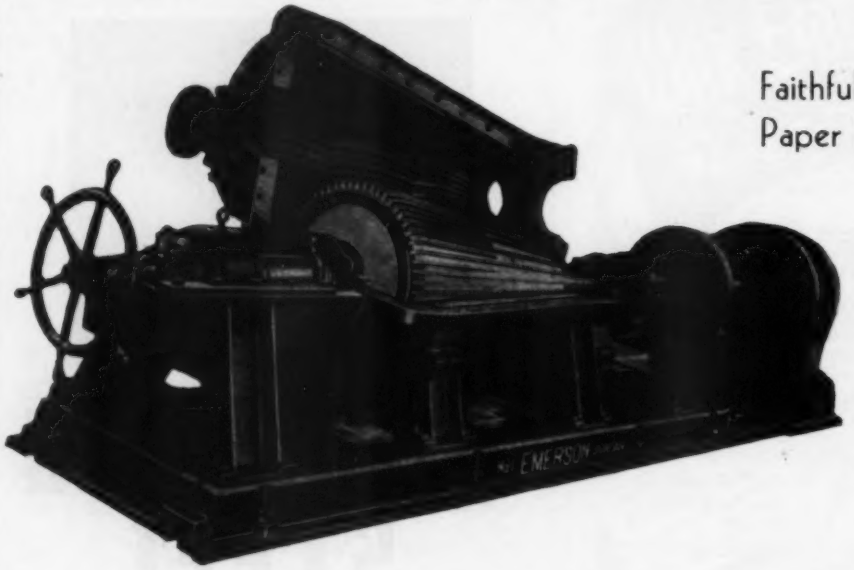

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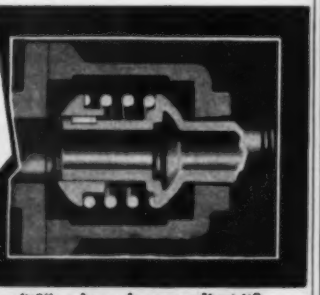
. . . a steam fit with the trouble left out?



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◆ Container Meeting at TAPPI Convention

Significant of the progress that has been made in the paperboard and container industries in the past few years will be the meeting to be held during the annual convention of the Technical Association of the Pulp and Paper Industry.

The important technical problems of this industry will receive serious consideration. It is doubtful if any part of the paper industry has made more progress in the short time in which this industry has recognized that it had problems that could be solved by technical investigations.

The TAPPI Container Committee which will sponsor this work is composed of J. D. Malcolmson, Robert Gair Company Inc., New York, N. Y.; H. L. Bode, Gaylord Container Corporation, St. Louis, Mo.; Pierre Drewsen, Hinde & Dauch Paper Company, Sandusky, Ohio; H. C. Koch, Auglaize Boxboard Company, St. Marys, Ohio; T. A. Carlson, Forest Products Laboratory, Madison, Wis.; A. W. Luhrs, Container Testing Laboratory, New York, N. Y.; Don L. Quinn, Chicago, Ill.; Hugo Schapiro, Ohio Boxboard Co., Rittman, Ohio; Albert Yraola Hinde & Dauch Paper Company, Ltd., Toronto, Ont.; and J. F. Halladay, Container Corp. of America, Manayunk, Pa.

The meeting program includes the following papers:

"Use Requirements of Folding Boxboards," by J. F. Halladay, Container Corp. of America

"Container Standards," by J. D. Malcolmson, Robert Gair Company Inc.

"A Method of Conditioning Corrugated Boxes and Box Boards for Test Purposes," by H. L. Bode, Gaylord Container Corporation

"The Influence of Atmospheric Humidity and Temperature on the Moisture Content of Paper Board." by R. W. K. Ulm, Container Corp. of America

"The Crush Test," by Pierre Drewsen, Hinde & Dauch Paper Company

"Requirements for the Packaging of Various Types of Food," by C. A. Southwick, General Foods Corporation

"Reasonable Sanitary Standards for Paper Products," by J. R. Sanborn, N. Y. S. Agricultural Experimental Station

In addition to the forementioned papers there will be a number of excellent papers on paperboard mill management, stock preparation, cylinder machine design and operation, drying and paper testing of interest to paperboard and container plant managers, engineers, chemists, superintendents. Anyone interested in attending will be welcome. Non-members of TAPPI should notify R. G. MacDonald, Secretary of TAPPI, of their desire to be present.

◆ Union Bag & Paper Profits Nearly Quadrupled in 1937

Fourth quarter profits of Union Bag & Paper Corporation last year totaled $330,471, net after all charges except Federal surtax on undistributed profits, according to a preliminary report made public today by Alexander Calder, president of the company. This was equal to 32 cents a share on the 1,045,733 shares of common stock outstanding.

Directors of the corporation today declared a dividend of 12½ cents per share of common stock payable February 18 to stockholders of record at the close of business February 15.

Subject to final audit, earnings of the company for the entire year 1937, after all charges except undistributed profits tax estimated at $65,000, were $1,419,595, equal to $1.30 a share on the common stock outstanding, Mr. Calder reported. In 1936 the company reported net income of $387,391 or 37 cents a share on the basis of the same number of shares.

"In spite of the general business recession of the last quarter of 1937, the company's sales and profit figures reflect the improvement that was anticipated from the new Savannah plant," Mr. Calder said. The first unit at Savannah came into production in the summer of 1936 and the second unit in the late summer of 1937. The third unit is now completed and ready to operate.

Commenting on the industrial outlook, Mr. Calder said: "Curtailed buying of the last few months has materially depleted stocks of wrapping paper and paper bags in the hands of distributors throughout the country.

"The necessity for replacing these stocks is already becoming apparent in the improvement in the rate of incoming orders in the kraft paper industry," Mr. Calder said.

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The equipment has proven its durability and profitableness in long satisfactory installations, to which we will refer. Each is individually designed to meet the specific mill needs. Ask for costs and operating data.

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This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worthwhile practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ Care of Controllers

The contacts of an electric controller assume a position of first importance. Of whatever type, they must be kept clean, pressure maintained and replaced when worn.

Sliding contacts, such as are used on drum and face plate type controllers. may be filed smooth if the roughening is not serious. It is not advisable to file contacts of the butt or rolling type. If not burned too seriously for continued use, they will wear themselves to a good seat. Contacts are designed to permit of a certain amount of wear and will withstand frequent operation with little wear if given proper attention. Contacts can be replaced with minimum trouble and expense, and it is generally economical to take advantage of this before wear makes it impossible to maintain the pressure specified by the manufacturer or before other complications develop.

The elements of a contactor arm or contact support are designed to exert a certain pressure between contacts, which serves to limit heating by reducing the resistance at the point of contact, and in the case of butt or rolling contacts to assist in making a quick break on opening of the switch. Pressure should always be maintained in accordance with specifications of the manufacturers, observance of which prevents low pressures that lead to heating and sluggish action and unreasonably high pressures that interfere with the proper sealing of the magnet armature. If an alternating current contactor fails to seal, the operating coil may burn out.

Oil dashpots should be examined at reasonable intervals to see that they are properly supplied with suitable oil in accordance with the manufacturer's instructions. By-pass and check valves should be examined and cleared. Dirty oil should be replaced. Substitution of oils other than specified or furnished by the manufacturer should be avoided, and only in extreme emergencies should exception be made, and then only by authorized and competent persons. If it is necessary to supply oil for the dashpots, choose that which will not become thick at the lowest temperature to which it will be subjected. Clean oil, having the proper characteristics, is essential for correct operation.

The proper holding and releasing action of low-voltage coils, under voltage coils, and mechanisms is dependent on both mechanical adjustment and application to the voltage (and frequency on alternating current systems) specified on the nameplate. Spring and gravity return mechanisms should be subject to inspection to insure that the return action is not too violent, causing return of the starter to the off position before the voltage has fallen to a value lower than would be reached in the ordinary variations in the line.

Alternating current release mechanisms should be inspected to see that the iron circuit is properly sealed and that the pole pieces are cleaned of rust and make a true flat contact. Care on this point will prevent humming and failure of coils from excessive current due to open iron circuits.

◆ A Recipe for Making Blueprint Paper

As a rule, good blueprint paper can be bought so cheaply and easily that it does not pay to bother with making it. However, it is sometimes worth while to know how to make a satisfactory blueprint paper solution. One that is frequently recommended is: Dissolve 3¾ oz. of ammonium citrate of iron in 18 oz. of water in a bottle. Then dissolve 2⅝ oz. of red prussiate of potash in the same amount of water in another bottle. When ready to prepare the paper have the sheets piled close at hand in a photographic dark room, lighted only by a ruby light. Mix equal parts of the solutions and apply to the paper with a sponge. Put the solution on in long parallel sweeps as evenly as possible, and on one side of the paper only. Then hang the sheets up to dry and keep them in the dark until used. Always throw away any of the mixed solution that is left, as it spoils quickly.

◆ Scale in Piping

Scale is likely to form almost anywhere in steam and hot water piping. It is particularly troublesome in feed water systems and other piping carrying water at high temperatures. The amount of scale depends upon the character of the water as well as upon the conditions of operation.

In feed water systems in which temperatures run up toward 200 deg. Fahr. and over, certain minerals in solution and suspension settle upon the bottom of the pipes and if allowed to remain sufficiently long, will harden and stick to the pipe. In time this scale becomes sufficiently thick seriously to reduce the capacity of the pipe. All pipe in which such deposits are likely to occur should be arranged for easy inspection, blowing out and, in some cases, mechanical cleaning. It is in line with good practice to install such piping with a sufficient number of flanges or, in the case of small pipe, of high grade metallic contact unions, to make it easily and quickly renewable.

High velocity of the liquid through the pipe is effective in keeping down the amount of deposit that clings to the surface. Feed pipes are commonly figured for velocities of 300 to 400 ft. per minute.

◆ A DIAGRAMMATIC LAYOUT of plant piping should be made if practicable and a copy of it posted in both boiler room and engine room. It should be sufficiently large to be clear. Each line and valve should be marked either upon the part itself or by number in connection with an index table on the drawing. The equipment controlled by the various valves and pipes should be clearly indicated.

◆ Lubrication of Brushes

Brushes, as a rule, do not require much lubrication. It is often recommended to boil carbon brushes in refined paraffin wax, but a trace of vaseline applied to the commutator is generally equally satisfactory. Graphite or graphitized carbon brushes are self-lubricating and as a consequence need no further lubrication. Graphitized carbon brushes will operate successfully at any angle and will give satisfactory results for most commercial applications. Oil should never be applied to the commutator on which graphitized brushes are used because it will form smut on the commutator surface, which causes poor commutation.

In case it is necessary to use some non-lubricating brushes, it is good practice to equip the machine with alternate sets of lubricating and non-lubricating brushes, the latter depending on the former to supply whatever lubrication is needed.

◆ WHEN THE LENGTH OF A CONNECTING ROD is reduced by constant keying-up, it results in the piston traveling much nearer to the front cylinder head. To prevent this shims are used back of the brass, next to the end of the rod. In some types of connecting rods the distance between the crankpin and the wristpin centers is lengthened by keying-up, and the shims should be placed between the brass farthest from the rod; that is, between the brass and strap.

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TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

IN THE PAPER INDUSTRY

◆ Differences Between Original and Ground Spruce Wood

The grinding process appears to cause a decrease in hygroscopicity (at 65 deg. and 90 per cent humidity). Spruce wood that has been steam treated shows this same effect. Mechanical pulp is much more sensitive when treated with ozone, heated, or subjected to direct sunlight than is the original wood. The author advances the theory that the yellowing of groundwood in sunlight seems to be associated with the removal of carbohydrates during grinding. Evidently newsprint that has been treated with glucose retains its color better than does untreated paper. Carl G. Schwalbe, Papier-Fabr. (Fest u. Auslandsheft) Tech Tl. 243-7 (1937).

◆ Lalang Grass in Papermaking

This grass *(Imperata Arundinacea Cyr.)*, a troublesome weed in many parts of the tropics, has been previously investigated as a raw material for pulp manufacture. Opinions variously expressed are: (by Cross and Bevan) that it was "equal to the highest qualities of esparto;" (by Aynsome Tech. Labs.) that a paper suitable for printing could be made; (by John Dickinson & Co. Ltg.) "as a papermaking material, it occupies an intermediate position between Spanish esparto and good straw fiber." References are given to the work of others who have examined lalang (or Illuk) grass. The most recent development was the formation of an Australian company in 1936, which is evidently erecting mills to manufacture from pulp in Papua and New Guinea and to produce writing and printing paper in Australia. The first unit of a plant having an annual output of 20,000 tons of bleached pulp is being installed in Papua. Since the grass is very common in Ceylon, a sample was forwarded to the Imperial Institute in September, 1936, which has given the following brief report:—moisture 8.8 per cent; ash, 6.1 per cent; cellulose, 42.1 per cent; average fiber length, 0.9 mm., width, .0074 mm. Two series of soda cooks were made [with 16 parts NaOH (3 per cent solution) per 100 parts of grass]. In the mildest cook the digestion period was three hours and the temperature 140 deg. C. The yield of bone-dry, unbleached pulp calculated to air-dry grass was 42.0 per cent (38.4 per cent after easy bleaching). The pulp was of fairly good quality, an advantage being that the original grass was found free from roots (which usually contaminate esparto) and from impurities such as are ordinarily found in straw. A comparable cook with Algerian esparto gave 46.6 per cent unbleached pulp. The fibers resemble each other somewhat, but the paper produced from lalang grass is harder and less bulky. The bleached lalang grass pulp alone, or mixed with other pulp, was found suited to the manufacture of printing, book and writing papers. The Bulletin of the Imperial Institute (abstracted through Paper-making and British Paper Trade Journal 94, No. 5 (Tech. Section) 114-5 (1937).

◆ Accomplishments and Problems in Wood Chemistry

A very brief outline is given of wood uses as fuel, in destructive distillation, pulp manufacture and acid hydrolysis, with subsequent production of alcohol, and protein feedstuffs, together with flow charts. The problems of the so-called Four Year Plan of the Third Reich include greater efficiency in the present wood using industries and the inauguration of new methods, including those to the formation of wood sugar, and the production of yeasts, rosin, and tannins. The article is mainly an exhortation, for the more effective utilization of waste products of wood, and of wood species native to Germany that have hitherto

been neglected. Attention is drawn pointedly to the unused 40 per cent waste in sulphite pulp production (consisting of lignin derivatives and pentosans); and to the 40-50 per cent hemicelluloses and lignin in sulphate and soda pulp manufacture, now used as fuel in regenerating NaOH. In the saccharification of wood, 35-40 per cent of the products (lignin and sugar degradation products) are only partially utilizable at present, The industrial utilization of lignin and of xylose is especially called for. The article is illustrated; the half-tone produced herewith shows the percolator house in a wood saccharification plant in Germany. Hauptmann Dr. Rolland Runkel. Wochbl. Papierfabr. 68, (Tech Tl) 903-7 (1937).

◆ Advances in Special Paper Manufacture

Difficulties met with in the preparation of waterproof papers include the use of soaps as emulsifying agents when asphalt, bitumen or tar are used as water repellants. Fairly large amounts of the emulsifying agents are required. This often results in greasy deposits on felts and drying cylinders. When larger quantities of this soap are used, the emulsion when admixed with stock requires the addition of acids or metallic salts to insure waterproofing. The grease separation, however, is not obviated in this way. While clay, when used as emulsifier (instead of soap) does not cause this trouble, it has other disadvantages. The waterproofing qualities of asphalt are diminished, and unnecessary loading of the paper results. Bitumen emulsions which do not appear to show this difficulty can be prepared by using emulsifiers made from the insoluble precipitates obtained by extracting vegetable tars with alkali, subjecting them to aeration, and finally precipitating them with acids, alkaline earth salts or salts of other metals. Such emulsifiers are not sensitive to (hard or soft) water and actually improve the water resistance of paper. They preserve the emulsion when mixed with the stock, and homogeneous products are obtained without preliminary separation of bitumen (cf. German Patent 616,179).

Bitumen emulsions in paste form are now also used in waterproofing. Here colloidal clay, coal dust, metallic hydroxides or silicic acid are used. The technique of making such pastes, which are actually bitumen suspensions, is briefly reviewed. The disadvantages of seeking to remove sticky components from asphalt by lowering the temperature are outlined. Emulsions of such powdered asphalt and clay cannot be stored for long and show certain other disadvantages over the pastes referred to above. The latter are much more stable in the face of temperature as well as physical changes and chemical admixtures. Reference is made to German Patents 625,123, which claims the preparation of roofing by the use of dry-ground bitumen to a particle size larger than the colloidal range. This is cooled and admixed with neutral substances, and then added to water containing certain stabilizers (since ground bitumen alone gives unsatisfactory results). Evidently such preparations do not cause separation on the paper machine. Special waterproof

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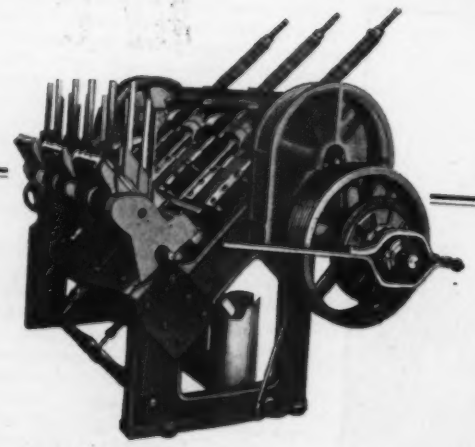

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papers may be prepared (cf. German Patent 622,825) by the admixture of cellulose derivatives with rubber, oil, fats or wax, homogenized in the presence of organic solvents, which are then driven off. The precipitated mixture is pulverized and may be added directly to the stock. The waterproofing in the finished paper is attained by heat and pressure. Such papers may be glued (this differing from paper containing only oil, paraffin, wax, etc.). Papers rendered transparent and waterproof by lacquer coatings are waterproof on the surface only. At the edges moisture is adsorbed, and resistance to tear is greatly lowered. Cracks in the lacquer film are also sources of trouble.

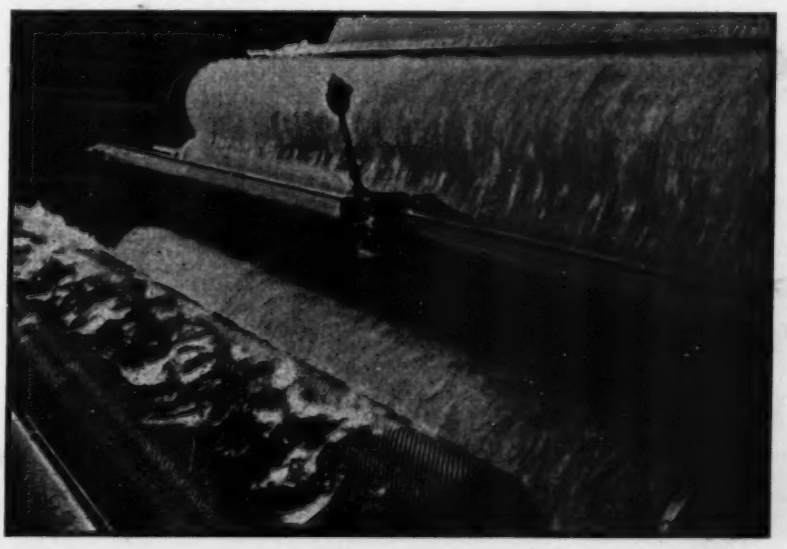
The production of fire-resistant papers is also discussed briefly. Mention is made of papers containing insoluble salts of stearic, oleic or palmitic acids. A special process entails the esterification (e.g., by use of stearyl anhydride) of cellulose, followed by treatment with solutions of fire-resisting chemicals and subsequent heating. A method is given for incorporating zinc stearate into the finished sheet. This is then treated in a bath at 50 deg. C. with alkali tungstate (borate or phosphate) and the triamide of phosphoric acid (made from $POCl_3$ and NH_3). The sheet is also treated with glue (probably to cause retention of the amide), the excess moisture removed under pressure, and the glue rendered insoluble in the sheet by treatment with formalin. The excess of reagents is washed out thoroughly with water, dried, calendered and glazed. Such paper finds a great variety of uses (e.g., cans, bottles, tape, bags, etc.). Since the maximum temperature used in steeping in the various baths is about 50 deg. C., the fiber is undamaged. Industrial hazards are slight (cf. German Patent 639,137). A. Foulon, Wachbl. Papierfabr. 68, Tech. Tl. 774-5 (1937).

◆ Felt Industry

This brief descriptive article gives a survey of felt manufacture, which is considered a key industry in Germany. At least 17 such factories exist which supply only the pulp and paper industry. Five illustrations are given; one herewith illustrates a preliminary stage in the manufacture, where flocks of carefully assorted clean wool are separated between thousands of small teeth on the surface of dentated rotating drums, until the fibers lie parallel to each other. Wochbl. Papierfabr. 68, (Tech Tl) 753-5 (1937).

◆ Heat Damage Prevention by Use of Pigment Indicators

Paints that show a marked change in color within definite temperature zones are used to prevent overheating of mill and factory equipment (e.g., oil circuit breakers, switchboards, contact points, cables, ball-bearings, hot water heaters, automatic cooling devices, drying chambers). Furthermore, through a combination of foils which change from brick-red to violet at about 65 deg. C., and photoelectric cells, signals can be given automatically to prevent fire or overheating. Metallic salts are often used. For example, a combination of cuprous iodide and mercuric iodide, which, below 60 deg. C. is scarlet, veers to chocolate brown at 60-70 deg. Silver iodide and mercuric iodide is pale yellow below 90 deg. C., and develops a brilliant carmine red at 90-100 deg. In general, these mixtures are incorporated into drying oils in the form of an oil paint, and to make the changes readily visible these indicator paints are bordered with white paint. When dry a coat of protective lacquer is applied. At times, pigment combinations are used which change color permanently above a certain temperature. For example, a mixture of lead sulphide and lead peroxide changes chemically on heating and a coating, which contains this mixture, becomes decolorized. A further development in heat-color-indicators involves the use of cellulose acetate films, containing heavy metal halides. Mixtures have been prepared which show color changes at 10 degree intervals between 35 and 300 deg. C. This leads to the so-called color-thermoscope. Dr. Fr. Wochbl. Papierfabr. 41, (Tech. Tl.) 776 (1937).



"In pipe, as in axles"...

WHEN people first looked at the slender axles of the old "Model T" Ford, most of them shook their heads. Alloy steels were not in general use then. A part, as they pictured it, had to be heavy to be strong. But the "Model Ts" kept on going and soon many parts of many things became lighter, and the old idea that weight was prerequisite to strength was for all time exploded.

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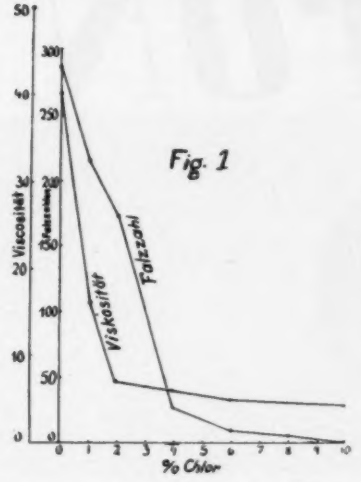
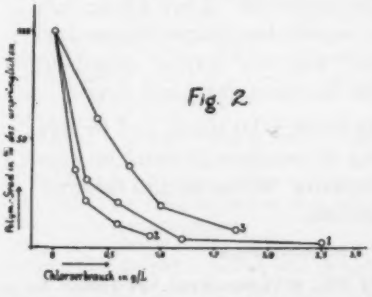
◆ Recent Work on Cellulose Oxidation

It is known that oxidizing agents, reacting with cellulose materials, may (1) remove readily oxidizable impurities, (2) may oxidize the anhydroglucose linkages without destroying the molecular chain

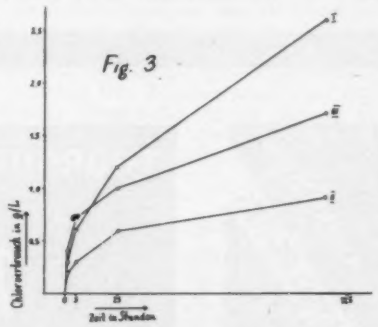


length appreciably (i.e., without appreciable drop in the degree of polymerization), (3) a major fissure and degradation of the cellulose macromolecule, i.e., a marked change in degree of polymerization (which we have termed D.P.). For example, under case (2) it is possible to cause oxidation of the primary or secondary alcoholic groups. If the primary groups are oxidized alone, a —COOH group may be formed, and this may be shown by cleavage to glucuronic acid, and also by the increase in affinity of the oxidized cellulose towards basic dyestuffs. Powerful oxidation causes a rupture of the long chain molecule. That this degradation cannot proceed at the extreme end of the molecule is indicated by the great decrease in mean molecular size even when relatively small amounts of strong oxidizing agents are used. Marked end-wise degradation would involve much larger quantities of oxidants. The hypothesis is that the chain macromolecules may be ruptured near the

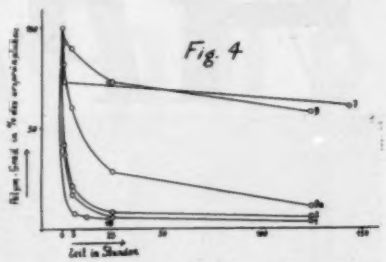


middle. The former hypothesis that the high viscosity of native cellulose was due to the presence of impurities, outer "skins" etc., is discounted. In general, native celluloses have a degree of polymerization (D.P.) of about 2,000 (i.e., 2,000 anhydroglucose units). The so-called oxycelluloses have D.P.'s ranging from 50-500. They are termed mesocolloids. The highly degraded oxycelluloses are very easily powdered, give solutions of low viscosity and these follow the Hagen-Poiseuille flow law. Physically then the oxycelluloses resemble the hydrocelluloses. Chemically, however, they are different in that carboxyl and ketonic carbonyl groups may be present in oxycelluloses. While the end groups of the hydrocellulose macromolecules are probably of a definite structure, the structure of analogous groups in the case of oxidized products is entirely unknown. For this reason, while the copper number (or iodine number) gives a measure of the average chain length in hydrocelluloses, it furnishes no such data in oxycelluloses.

Viscosity measurements give valuable criteria in bleached cellulosic products, since resistance to tear, tensile strength and folding resistance are, in part, functions of the chain length. Care in bleaching will obviate marked changes in the length of a macromolecule. However, the D.P. of a cellulose does not necessarily determine the strength of a paper sheet. For example, dead grinding (overbeating) of cellulose leaves it with approximately the initial D.P., but makes it completely unsuited for papermaking. On the other hand the fiber strength is important, and this is certainly conditioned by oxidation. Frequently, however, in certain industries

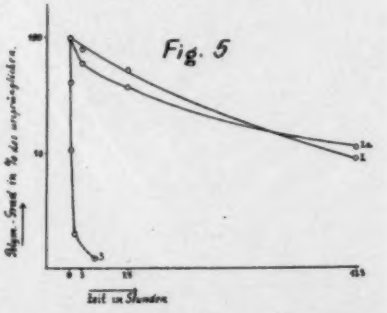


oxidation is resorted to deliberately. This is true in forming cellulose esters and ethers in lacquer production. Here the D.P. of the so-called eucolloids (>500) is too high. Only mesocolloids, with a degree of polymerization of 200-500 can be used. These products of lower chain length permit the formation of 10-20 per cent sols, for lacquer purposes—whereas those of high degree of polymerization are so viscuous that only very dilute solutions are practicable and then would not have sufficient covering power. Cellulose is degraded by oxidation whenever cell wool or rayon are formed. Again the high viscosity of the solutions militates against the use of a highly polymerized products. In cuprammonium silks the bleaching of linters followed by oxidation in the copper spinning solution reduces the D.P. from 1,500-2,000 to 400-500. Bleached pulps used in (viscose) rayon manufacture usually have an initial D.P. of 600-900. This is decreased further when the alkali cellulose is ripened, and the final viscose has a D.P. of 250-300. (In the case of Schwarza or Lanusa cellwool, the D.P. is 400-500. In the case of acetate silks, with a D.P. of 250, the degradation is accomplished by acetolysis). The authors point out that in many instances a higher chain length might insure better properties to rayons; for example, greater wet-strength and higher folding resistance. Hence, the macromolecular length may have a marked industrial significance.



The effects of various bleaching agents (oxidizing agents) on cotton linters reprecipitated from Schweizer's reagent were carefully studied. This reprecipitation had as its object the removal of small amounts of readily oxidized impurities. The D.P. of such reprecipitated material varied, but it usually varied from 1,200 to 2,300, and in each experiment comparative data were obtained by using an individual sample with a definite initial D.P. Ordinary bleach solutions (calcium hypochlorite) and of chlorine water have a drastic action in lowering viscosities.

Figure 1 shows graphically the decrease in number of folds (Falzzahl) and in viscosity with increasing chlorine content of a bleach. (This is taken from Heuser and Opfermann's Die Bleiche des Zellstoffs.) The present authors using low concentrations, when the D.P. was high, and higher concentration as the viscosities (and D.P.'s dropped) have shown that from a reprecipitated cellulose (D.P., 1,200) chlorine water (7.5 g. Cl. per liter at 20 deg.) lowered the D.P. to 450 in one hour, to 205 in five hours, to 68 in twenty-five hours and to 40 in 125 hours. This means that the average molecular chain length after about 5 days was only 3 per cent of the original. A very similar result was ob-



tained when the cellulose was treated with calcium hypochlorite solution (21 g. active Cl. per liter at 20 deg.). Here the respective D.P.'s at the end of similar time periods were: 525, 260, 105 and 70. Much lower concentrations of chlorine in the hypochlorite solutions gave surprisingly similar results. With a moist reprecipitated cellulose, D.P. 2,300, (cf. Graph 1, Fig. 2), the respective changes

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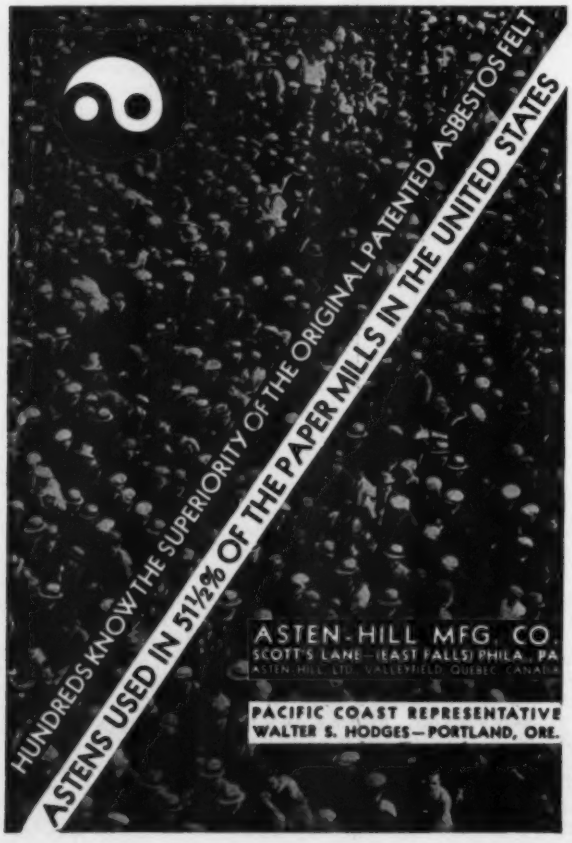
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MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

in D.P. were 735, 495, 89, 45. Similarly, a carefully dried cellulose (Graph 2, Figure 2) behaved in much the same fashion. A raw cotton D.P. 2640, while somewhat more resistant, also showed a rapid fall in viscosity (Graph 3, Figure 2). In Figure 2, Polym-Grad equals D.P. in per cent of original D.P. which is arbitrarily taken as 100 and is plotted against chlorine consumption in grams per liter (Chlorverbrauch).

In Figure 3, data on the same materials are shown graphically. Here chlorine consumption in g/l is plotted against bleaching time in hours. (Zeit in Stunden.) When the change in D.P. is plotted against bleaching time, the curves of samples 1, 2 and 3 are very similar. Despite these data, the authors show that with very careful bleaching of cotton yarn (carried out industrially by the Firma Mez, A.G. at Freiburg Braj) such drops in D.P. may be prevented. A cotton D.P. 2690 was lowered to 2175 on mercerization and to only 1820 on further treatment with calcium hypochlorite. Very different from the action of chlorine or calcium hypochlorite is the action of chlorine dioxide (used by Erich Schmidt and his co-workers in the isolation of cellulosic material). The drop in D.P. is slow when 0.25 per cent ClO_2 is used as shown by the following: initial D.P. (1440), after 1 hour (1050); after 24 hours (1050), after 144 hours (870). Even with 1.7 per cent ClO_2 solutions the respective changes are 885, 705 and 550. If pyridine is added to the 0.25 per cent ClO_2 purified cotton cellulose (D.P. 2400) changes very slowly. Only after three weeks was the D.P. about 825. Pyridine alone is almost without effect on cotton cellulose, the D.P. at the end of three weeks being 2,000. It is obvious that Schmidt's method, when carefully applied, serves to purify cellulose without altering its chain length and after several hours, it gives a clean white material which is practically undegraded. Hydrogen peroxide (1 per cent solution) also acts slowly on cellulose (D.P. 1180). In 1.0N acetic acid this oxidant caused the following changes: 1100 (in 1 hour); 1060 (in 5 hours); 860 (in 25 hours); and 680 (in 125 hours). It is somewhat more actively destructive in 2 N NaOH. Here the respective changes in D.P. for the same time periods were 970, 710, 330 and 125. Hydrogen peroxide may therefore be used in bleaching rayons or cottons. While potassium permanganate has no practical significance as a bleaching agent, the authors included it in their series. Its action is extremely powerful. Even 0.2 per cent $KMnO_4$ action on cellulose (D.P. 1550) at 20 deg. for 6 hours shows a drop to D.P. 220. Its oxidizing action is a function of the concentration.

Figure 4 shows a composite series of comparative graphs in which the change in per cent D.P. (Polym-Grad) is plotted against time. [Here, graph (1) shows the action of 7.5 g/l chlorine water, (2) action of calcium hypochlorite (21 g. Cl/l) (7) ClO_2 in 0.25 per cent solution; (9) 1 per cent hydrogen peroxide in acetic acid; (9a) hydrogen peroxide in NaOH); (10) 0.8 per cent $KMnO_4$]. Evidently (10) shows the sharpest drop in D.P. The authors also studied the antioxidative degradation of cellulose in Schweizer's reagent. With a 1 per cent of linters (D.P. 1070) in cuprammonium hydroxide carefully protected from light and air at 20 deg. C., the change at the end of 125 hours was small (D.P. 915). In this same time period when air was excluded, but the solution irradiated with a 300 watt lamp, the D.P. had changed to 460. When linters (D.P. 1400) were exposed to light and the solution aerated, as well, the drop was to 210 D.P. in 125 hours, and to 60 in 625 hours. These differences are shown in Fig. 5—where (2) and (2a) are changes in D.P. with time, when air, but not light, is excluded, while (3) shows the rapid drop where irradiation and aeration have their effects. This abstract is taken from the 176, 177 and 178th communications on the high polymeric compounds. H. Staudinger and J. Juresch. Papier-Fabr. 35, No. 49, 459-471 (1937).

◆ Absorption of Ultraviolet Light by Cellulose

The absorption of ultraviolet light by various cellulose films does not depend only on the amount and type of groups in the derivatives, but on the particle size as well. The transmission of short wave lengths Cellite is best, then follow triacetylcellulose and cellophane, while cellulose nitrate films and benzylcellulose are the poorest. Evidenty nitrate and benzyl groups absorb light strongly. When cellite was fractionated from acetone-benzol mixtures, that fraction which was most readily soluble showed the highest absorption. T. Nakashima and M. Negeshi, J. Soc. Chem. Ind. (Japan) 39, 102-5 (1936).

◆ Molecular Surface Tension in Pulp and Papermaking

The original article gives surface tension measurements of size solutions, cooking and waste sulphite liquors. The former were measured by the method of maximum bubble pressure in Rehbinder's instrument, and by counting drops (in the Traube's stalagnometer). A rapid method for the determination of rosin in sizing solutions was devised depending on surface tension measurements. In sulphite liquors, measurements show that these dispose of those ingredients that are active in lowering surface tension. During the main course of digestions (leading to hard and soft pulps) surface tension decreases, but rises again at the end of the cooking process. Surface tension measurements are suggested as routine control tests during digestions. Kowalewskij. Bumaschnaja Promiuschlennost, No. 1, 20 (1937), through Papier-Fabr. 35 (Abstracts) 175 (1937).

◆ JOSEPH GODWIN has retired from the partnership making up the Bulkley, Dunton & Co. and will continue his fifty-two years association with the business in an advisory capacity. Partners of the firm are Jonathan Bulkley, Franklin A. Stone, J. Ogden Bulkley and Edward G. Lloyd.

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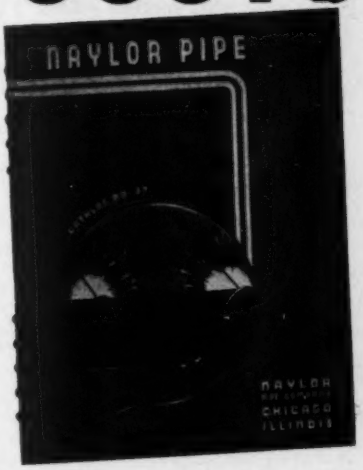

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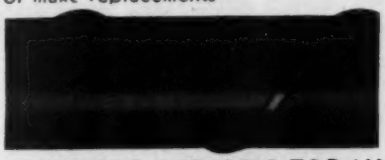

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PAPERMAKING PATENTS

IN THE UNITED STATES

Inquiries with reference to any of these patents should be addressed to James Atkins, Munsey Building, Washington, D. C.

Compiled by James Atkins, Registered Patent Attorney

20,606—Paper Making Machine. Charles R. Seaborne, Appleton, Wis., assignor, by mesne assignments, to American Lakes Paper Company, Waukegan, Ill., a corporation of Delaware. Original No. 1,517,018, dated November 25, 1924, Serial No. 676,705, November 24, 1923. Application for reissue June 25, 1936, Serial No. 88,268. 5 Claims. (Cl. 92—48). In combination, a drying cylinder of a paper making machine, and a marking roll arranged to be forced toward said cylinder so as to directly engage and compress a web of paper manufactured by said paper making machine between said drying cylinder and said marking roll to accomplish an ornamental marking thereof, said marking roll comprising: a rigid core, a continuous, single, one-piece outer sleeve-like layer of hard rubber, and means resiliently supporting said outer sleeve-like layer relatively to said core, said means including a cushioning layer of relatively soft rubber interposed between said core and said outer sleeve-like layer; the outer surface of said outer sleeve-like layer being finished concentric with respect to the axis of rotation of said marking roll, as by a grinding operation, said marking roll and drying cylinder being relatively crowned so as to maintain a substantially uniform nip pressure across a web of paper, portions of the material of said outer ground surface being removed, as by an engraving operation, so as to leave lands which constitute a design that it is desired to impart to a web of paper during a marking operation thereon, said lands being sufficiently rigid to effect a desired marking and being sufficiently resilient to avoid injuring a web of paper when used in direct contact therewith during a marking operation.

2,098,533—Method or Process of Treating Paper. Herman Carew, Easton, Pa., assignor, by mesne assignments, to Dixie-Vortex Company, Chicago, Ill., a corporation of Delaware. Application May 8, 1934. Serial No. 724,615. 3 Claims. (Cl. 91—70). The method or process of treating receptacles or containers made of paper or similar material which consists in initially applying high temperature paraffin or similar material at the point of manufacture of the receptacle and then applying a coating of low temperature paraffin or similar material after shipment to the point of use and just prior to filling, said last application acting to sterilize the receptacle or container just prior to use.

2,099,880 — Composition of Matter Adapted for Increasing the Water-Resistance of Fibrous Substances Specifically Paper Products and Process of Making Same. Carleton Ellis, Montclair, N. J., assignor, by mesne assignments, to Ellis-Foster Company, Montclair, N. J., a corporation of New Jersey. Application November 22, 1929. Serial No. 409,185. 3 Claims. (Cl. 134—22). A paper sizing composition comprising a blown wax softened with an oil.

2,101,874—Composite Fabric. William Wallace Rowe, Cincinnati, Ohio, assignor to The Paper Service Company, Lockland, Ohio, a corporation of Ohio. Application March 8, 1934. Serial No. 714,647. 12 Claims. (Cl. 154—50). A composite fabric comprising at least two layers of paper and a plurality of layers of cementitious substances located therebetween, one of said layers of cementitious substances being a layer of rubber derived from latex, and at least one other of said layers of cementitious substance being a layer of bituminous material, said layer of bituminous material lying between a paper face of said composite fabric and said layer of rubber derived from latex.

2,102,004—Process of and Apparatus for the Manufacture of Paper and the Like. Edward Hutchins, Glens Falls, N. Y., assignor to International Paper Company, a corporation of New York. Application February 19, 1935. Serial No. 7,163. 4 Claims. (Cl. 92—38). In a process for the manufacture of paper wherein a fibrous stock is deposited on a web forming device and subjected to drainage whereby gradually to build up a fibrous web of suitable thickness, the steps of smoothing over that layer of fibres which is initially formed into a web as water is withdrawn from the pulp suspension, and simultaneously agitating the remainder of said stock in a direction transverse to the movement of said formed web and thereafter forming said stock with said formed web into a unitary web of fibrous material.

2,102,170 — Paper Machinery. Isaac Stern, New York, N. Y. Application November 17, 1934. Serial No. 753,441. 4 Claims. (Cl. 164—11). In combination in a unitary structure, a scorer for engaging a sheet of blank material; a source of power; eccentric straps for translating the power from said source to said scorer for scoring said sheet of material; a metal pair of vertical guides for guiding said scorer in a vertical path; a plurality of rotary scorers; means for applying power from said source to said scorers for producing flap scores; a plurality of rotary trimmers; means for supplying power to said trimmers for trimming said sheets of material; adjustable block and cut-out means; separate power means therefor; and means for controlling the application of power thereto for blocking and cutting said blanks.

2,102,207—Coated Paper and Paper-Coating Compositions. James K. Hunt and George H. Latham, Wilmington, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware. Application January 23, 1936. Serial No. 60,521. 8 Claims. (Cl. 91—68). A highly grease-proof, water and moisture resistant product comprising paper coated with a composition which comprises a mixed alkyl ether of cellulose containing in the same molecule lower saturated alkyl radicals of not more than two carbon atoms and higher saturated aliphatic alkyl radicals of at least eight carbon atoms.

2,104,052—Apparatus for Making Saturated, Sized, Filled, or Coated Paper or Fiberboard. Izador J. Novak, Bridgeport, Conn., assignor to Raybestos-Manhattan, Inc., Bridgeport, Conn., a corporation of New Jersey. Application July 19, 1933, Serial No. 681,056. 4 Claims. (Cl. 92—40). The combination with a paper forming machine having means for felting aqueous fibrous pulp into the form of a continuous wet web, of a vat containing a bulk supply of selected permeating medium in liquid condition, a hollow roll having a foraminated surface rotatably positioned in said vat, means, separate from and independent of the web felting means, for passing said continuous wet web into contact with said permeating medium, comprising, an endless foraminated conveyor for confining the wet web between its surface and the foraminated surface of the roll to prevent disintegration of the web during its passage in contact with said permeating medium, means for condensing said web to remove excess liquid and means for removing said condensed web from the conveyor.

2,104,774—Paper Roll and Method of Splicing to Expiring Web. David J. Scott, Plainfield, N. J., assignor to David J. Scott, executor of the estate of Walter Scott, doing business as Walter Scott & Company, Plainfield, N. J. Application June 12, 1935, Serial No. 26,306. 13 Claims. (Cl. 242—58). A roll of paper adapted for rotation on its axis and having an exposed leading end, a weakened area in said end, and means for connecting said weakened area to the body of the roll, for the purpose set forth. The method of separating a web end, which is in connection with a web roll at a point on its leading edge, which consists in causing adherence of the web end to a running web, thereby tearing the web end beside the point of connection.

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The COMMERCIAL OUTLOOK

New York, February 1, 1938.

WHILE paper and board mills as a group are far from busily engaged, improvement has been scored since the dull days of December. This is not saying a great deal, however, because the industry got down to an almost unbelievable low schedule of production during the weeks prior to the turn of the year. Nevertheless, demand for some classes of paper and board has increased; spot buyers have been in more evidence, and contract customers have ordered out larger shipments, with the result most mills have had to step-up manufacturing operations to some extent.

The situation is still much of a waiting one, waiting for general business to revive, for sentiment to switch around leading to more confidence and a readier tendency to anticipate requirements, and for paper consumers, jobbers and converters to enter the market as buyers on a nearer normal scale. That the industrial situation is pointed better, there seems no question. Encouraging indeed are the expressions of belief in numerous quarters that the recession which set in during the late months of 1937 has scraped bottom, and that manufacturing and trade are on the upturn and give every promise of working out of the unfavorable and unfortunate condition witnessed in recent months. Opinion appears to be crystallizing that business will snap out of its depressed state sooner and with greater rapidity than a majority looked for until lately.

Meantime paper and board mills which curtailed to two and three days a week, or even to a more serious degree, prior to the holiday season are now running four and five days weekly. In almost every instance they are producing only such product as they have a sale for. There is no manufacturing for stock; instead, papermakers are exerting every effort to reduce their inventories to the proverbial bone, and consumers and converters, too, are much more intent on lowering stocks than in augmenting them. This is a healthy condition which harbors well when demand gets into swing again and users find their needs for paper expanding.

Raw materials of most kinds are reduced in cost and appear likely to move to still lower levels. Paper manufacturers, meanwhile, are doing what they can to maintain the equilibrium of their market and are holding quotations on the finished product as steady as circumstances will allow. Thus, when the market assumes broader dimensions, paper producers will be in a position to benefit by securing a wider margin of profit, if they see fit to do so. An increase in consuming demand, which most members of the industry sincerely feel is not far off, should prove remuneratively advantageous to manufacturers.

The monthly index of magazine advertising for December showed a decline of 2.2 per cent from the figure for the same month in 1936, and a decrease, when corrected for seasonal variations, of 3.4 per cent from November, 1937. For the year 1937 magazines registered a gain of 10.4 per cent over 1936, according to Printers' Ink.

A new high record of newsprint production in North America was reached during the last calendar year at 4,943,717 tons, an increase of 11.3 per cent over the 1936 total of 4,439,876 tons, according to News Print Service Bureau statistics. Canadian output of print paper in December continued ahead of that for the same 1936 month, amounting to 293,038 tons, compared with 289,312 tons, a rise of 3,726 tons, or 1.29 per cent. United States output was 79,537 tons, against 80,048 tons in December, 1936, a decrease of 0.64 per cent, while Newfoundland production was 26,085 tons, contrasted with 27,601 tons, a decline of 1,516 tons or 5.5 per cent.

Canada produced a total of 3,645,309 tons of newsprint in 1937, against 3,179,914 tons in the year preceding; the United States produced 945,721 tons, against 920,317 tons, and Newfoundland 352,687 tons, against 327,964 tons. Thus, Canadian production was 14.3 per cent above 1936; United States, 2.6 per cent, and Newfoundland, 7.5 per cent.

Shipments during December continued to run well ahead of current production. Canadian mills shipped 306,137 tons, and United States mills 88,339 tons. As a result, stocks at Canadian mills at the end of 1937 were reduced to 34,552 tons, compared with 47,772 tons at the end of November last, and stocks at U. S. mills were down to 15,105 tons, against 24,064 tons a month previously. Mill stocks in both countries amounted to 49,657 tons on December 31 last, contrasted with 71,558 tons on November 30 last and 38,745 tons at the end of 1936.

However, having produced in 1937 considerably more newsprint than was consumed by publisher customers, the newsprint industry is currently curtailing its operations to permit the working off of the big stocks which have accumulated with publishers. With production last year a half million tons in excess of the 1936 output, latest figures show that publishers' stocks rose 229,932 tons or 71 per cent from the end of May last to the end of November, when they totaled 555,290 tons. Operations of the industry were reduced in December, and to a further extent during January. One of the large Canadian mills has curtailed to three days a week. Premiers of Ontario and Quebec have been meeting with various newsprint officials on the question of assisting curtailment.

Production of paperboard in the United States in November amounted to 267,567 tons, a sharp decline from 334,619 tons in the preceding month and also from the 321,624 tons produced in November, 1936. Output during the first eleven months of last year totaled 4,044,452 tons, compared with 3,330,098 tons in the corresponding 1936 period, and 3,050,461 tons in 1935, according to U. S. Census Bureau figures. New orders received by mills in November called for a total of 254,781 tons, against 315,122 tons in the month before, and unfilled orders held by manufacturers at the close of November were for 74,173 tons, contrasted with 88,775 tons a month previously and 108,467 tons two months before.

Shipments of prepared roofing from producing plants in the United States totaled 2,073,579 squares in November, compared with 3,014,217 squares in October last and 2,591,991 squares in November, 1936. Eleven months' shipments in 1937 aggregated 28,804,003 squares, against 30,774,852 squares in the same 1936 period, and 24,896,536 squares in 1935.

◆ ◆

◆ American Foresters Elect New Officers

The Society of American Foresters has announced that officers and council members have been elected for the two-year period 1938-39 and have already taken office. New president of the organization is Dr. Clarence F. Korstian, who is director of Duke Forest, Duke University, Durham, S. C. William G. Howard, director, Division of Lands and Forests, Conservation Dept., Albany, N. Y., was elected vice-president.

◆ Customs Case Involves Duty on Japanese Tissue

A case involving the dutiability of Japanese tissue paper made of the Yoshino fibre, was tried recently before the United States Customs Court on a claim by the importer that this paper, sometimes sold in discs for coffee filters, was dutiable at 5 cents per pound and 15 per cent as filtering paper.

The customs officials had classified the paper as tissue paper at 6 cents per pound and 20 per cent or at 30 per cent as paper cut into shapes. Witnesses for the domestic producers testified the paper was used for many other purposes besides coffee filters and the import committee, in assisting the Government in the trial, sought to prevent a classification of this paper which would permit its importation for other purposes at less than the rate of duty for tissue paper. No decision will be reached until briefs have been filed.

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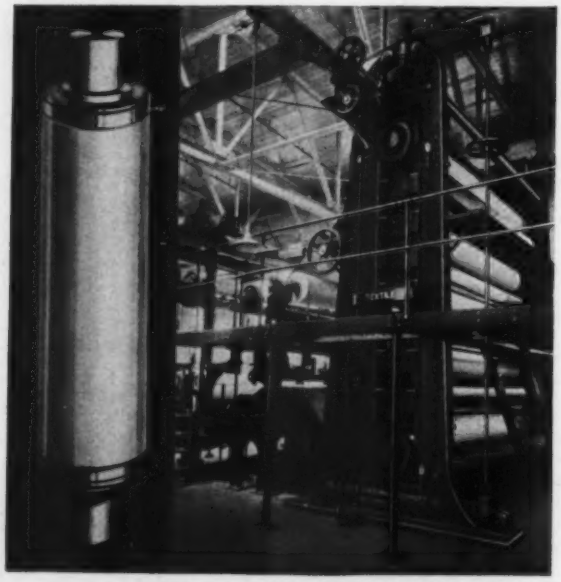

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THE PAPER INDUSTRY

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Domestic RAW MATERIALS

◆ Papermaking Rags

There is a pronounced hesitancy on the part of paper manufacturers to purchase raw material, although it can be said activity in the markets has shown some improvement as compared with the extreme dullness prior to the turn of the year. Absorption of supplies at present is being confined practically exclusively to needed materials, and since most mills are apparently well fixed with stocks on hand or on order and as their requirements are developing rather spasmodically, demand for rags, pulp and other papermaking items is spotty and of light aggregate volume.

Nevertheless, there are signs of better interest, in some quarters at any rate, and opinion in the raw material trades is crystallizing that buying by mills is due to expand after an unusually lengthy period of market dullness. Belief in this connection is based on reports of a pick-up in activity among paper and board mills, and indications that some mills are gradually reaching a stage where replenishment of supplies will become a necessity.

Papermaking rags appear to be hardening in price, due to dealers putting up considerable resistance to any further recession in market levels and their seeming willingness to hold back rags for anticipated better values. As a matter of fact, prices of a few grades of rags actually have scored slight advances from the bottom points reached during the pre-holiday downtrend. Dealers and importers are stressing the supply condition, asserting that incoming rags from production and collection sources have undergone a sharp decrease, with no prospects of supplies increasing until general industrial conditions improve and more cuttings or other new rags are produced and until market prices rise to encourage collections of old rags.

With the Federal Government aiming to prime home construction the country over, the outlook is favorable for larger consumption of roofing felt and building papers, and roofing rags are being held with a good deal of firmness by dealers, particularly since importations have fallen off appreciably and shippers abroad demand prices far in excess of market levels prevailing in the United States currently. Mills in the East have advanced their bids on domestic roofing rags $2 a ton, and now are evincing readiness to pay 1.15 cents a pound for No. 1 classification roofing and 85 cents per hundred pounds for No. 2 grade f.o.b. New York. Brokers declare it is difficult for them to get rags at these levels of value, packers in a great many cases refusing to sell while content to wait out the market.

Fine paper manufacturers are purchasing new cuttings in single-carload style, generally speaking, as their needs dictate. Still, something of a firmer or at least a steadier undertone is noted in most classes of new rags. The nominal market basis on No. 1 white shirt cuttings is 7 to 7.25 cents a pound f.o.b. dealers' points, yet it is questioned whether any of these rags are obtainable at 7 cents, if even at 7.25 cents. Foreign markets are absorbing white shirt cuttings, and there is reason to believe quantities of these rags in the hands of dealers are small. New soft unbleached muslins are quoted at 7.25 cents a pound at shipping points, new blue overall cuttings at 6.25 cents, light silesias at 5.25 cents, bleached canton flannels at 7 cents, fancy shirt cuttings at 2.75 cents or higher, washables at 2.50 cents, new white linens at 11 cents and grey linens at 10 cents.

◆ Rope and Bagging

Old manila rope is a papermaking material in a market position bordering onto dormancy. There is almost no demand emanating from consuming quarters, and prices are strictly a nominal matter. Mills using old rope say they are heavily stocked and are little disposed to add to their supplies. Domestic No. 1 old manila rope is about 3 cents a pound f.o.b. shipping points, and the foreign article 2.75 cents ex dock American Atlantic ports. It is probable that mill buyers could pick up some lots of a distress variety at below these price levels. Old bagging is quiet also, few paper manufacturers manifesting a desire for supplies and other consumers buying lightly. Domestic No. 1 scrap bagging is reported at 1.65 cents a pound or thereabouts, and roofing bagging at around 80 cents per hundred pounds.

◆ Old Paper

With paper and board mills trending more to wood pulp to the exclusion of waste paper wherever feasible, and with those mills using old paper chiefly as a raw material operating on curtailed schedules, the market for waste paper is quiet at best. Demand does not commence to take up the supply offered, and the only outcome possible is the result—easy prices and prices remaining on unusually low levels. True, as regards several grades, demand has expanded to a sufficient extent to run prices up a bit, but these are the exception and the market as a whole is much in want of consuming orders.

The all-important grade of No. 1 mixed paper is selling in the East at $2.50 a ton or 12½ cents per hundred pounds f.o.b. dealers' shipping points, the lowest price witnessed in a long time. Packers declare they cannot possibly break even on such a price level, and they doubtless are right. Folded news is 30 cents a hundred pounds in the East at shipping points, old corrugated boxes 30 cents a hundred pounds, overissue newspapers 45 cents, heavy books and magazines 50 cents, and No. 1 old kraft paper 65 cents. In the case of the high grades, more particularly white shavings and envelope cuttings, packers in frequent cases are holding back stock, refusing to sell at the prices bid. Yet there is not much demand, and No. 1 hard white shavings are reported offered at 1.85 to 2 cents a pound for ordinary quality, No. 1 ordinary soft white shavings at 1.60 to 1.70 cents, and No. 1 hard white envelope cuttings at 2.25 cents. White ledgers have firmed to where New York dealers ask 1.30 cents and higher per pound f.o.b. that city.

◆ Pulpwood

Not much open-market demand is recorded for pulpwood but supplies are moving steadily against contracts, and quoted rates have registered little change. Reports say customary amounts of wood will be cut this season, if not increases over a year ago in some regions.

◆ Mechanical Pulp

While groundwood from Europe is being offered in some instances for resale at sharp concessions in price far below current replacement costs abroad, domestic and Canadian producers are adhering relatively firmly to a basis of $35 a ton delivered consuming centers in northern United States for prime freshly-ground pulp, or $30 per ton ex dock U .S. Atlantic ports for Canadian groundwood brought down by schooners. There is little call for supplies in the outside market, consumers as a rule managing to get along on contract commitments without having to buy currently. It is no secret that producing plants in some cases have found it necessary to curtail their grinding operations.

◆ Chemical Pulp

Domestic manufacturers of pulp are adhering steadfastly to the lower contract bases announced in late December for the first quarter of 1938 and are not pressing sales while realizing most customers are topheavy with pulp supplies and are more interesting in reducing inventories than in augmenting their pulp stocks. Very little current buying is being done. Domestic prime bleached sulphite is 3 to 3.20 cents a pound and unbleached sulphite 2.50 to 2.60 cents ex dock American Atlantic seaboard, while bleached soda pulp is 2.90 cents delivered consuming points. Domestic kraft pulp is uncertain in price at about 2.25 to 2.50 cents a pound delivered for southern, and 2.75 to 3 cents for No. 1 northern or Canadian kraft pulp.

◆ Chemicals

Not many price alterations occurred in papermaking chemicals at the turn of the year. Casein is 10.50 to 11 cents a pound for the domestic standard ground, and half a cent higher for finely ground.

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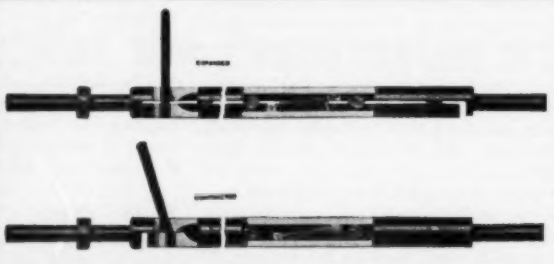

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Import and Export MARKETS

IMPORTS

◆ Wood Pulp

It has been a long time since business in imported chemical wood pulp was so near a complete standstill. It is doubted if ever before, or at any rate since American paper manufacturers began looking to Europe to supply a portion of their pulp requirements, has a paucity in buying of pulp abroad been recorded of an intensity as is now current. Paper and board manufacturers are virtually entirely out of the market as purchasers. The reason is very plain; consumers in this country are so heavily supplied with pulp that their one concern at present is in reducing inventories, certainly not adding to their stocks or commitments.

Buyers are not interested in purchasing nor are sellers abroad, apparently, eager to effect further sales in the American market for the time being. Producing mills on the other side of the Atlantic, or a large majority of them, are well sold for this year; having their output under contract they are not pressing offerings on an unwilling market; moreover, such tonnage as they have available for sale is being disposed of, according to reports, in markets other than the United States and at prices in excess of those which could feasibly be obtained here under present circumstances. Therefore, many producers in Europe are not making any offers to America; they are adopting a waiting attitude hoping that the market situation will in time improve, and evidently deeming it wise policy to refrain from attempts to effect sales now.

Hanging over the market here are large accumulations of pulp on the docks at American Atlantic ports, and elsewhere, which is to say in consuming mill storehouses. There has been a tremendous backing up of pulp supplies in recent months. The unexpected slump in paper business during the final quarter of the old year caught practically all paper mills unawares. Pulp shipments in big tonnage continued to come in, and sooner than anyone believed possible, the market became greatly over-supplied; in fact, glutted with pulp—in warehouses, on docks and en route from primary sources abroad.

Accordingly, buying of pulp has been halted with a vengeance. There is no demand, or scarcely none. What little purchasing of a current nature is being done is confined almost entirely to resale pulp. By far more sellers among consumers are in the market than there are consuming buyers. The likelihood is there would be a great deal more reselling of surplus lots of pulp if buyers could be found to take it off the hands of consumers who find themselves with more supply than they need or want.

Nevertheless the market is maintaining its equilibrium. There is no feeling of concern; no urgent selling, or undue pressure to dispose of pulp not required under prevailing circumstances. Pulp importers and agents at New York are standing by, making few offers, waiting for the situation to adjust itself. Manufacturers in Europe and in the United States and Canada are pursuing a waiting policy also, exerting no visible pressure on customers to take pulp or to engage in further buying. Prices, while mainly nominal, are holding remarkably steady quotably; it is an absolute fact that producers abroad are refusing to meet low bids when they are made, evincing no inclination to accept the nominal prices prevailing in the market here while enabled to secure more favorable values for their pulp in other consuming markets.

Asking rates from Europe are approximately 4.50 cents a pound for prime bleached sulphite, 3.50 cents for prime strong unbleached sulphite, 3.75 cents for easy bleaching sulphite and 2.75 cents for prime standard Swedish kraft pulp for shipment this year ex dock American Atlantic seaboard.

Importations continued on a heavy scale during November, when a total of 188,288 short tons of chemical pulp of a declared value of $8,510,562 arrived at U. S. ports, according to Department of Commerce figures, comparing with 184,074 tons valued at $8,240,974 in the month preceding and 177,034 tons valued at $7,041,105 in November, 1936. Eleven-month imports last year reached the imposing aggregate of 2,014,811 short tons, against 1,857,467 tons in the corresponding 1936 period, a new all-time high in 1937. Groundwood imports were 19,351 short tons of a value of $389,792 in November, for a total of 202,532 short tons in the first eleven months of 1937, contrasted with 204,266 tons in the same time of 1936.

◆ Paper Stock

Imports of rags for papermaking into the United States in November last amounted to 16,245,575 pounds of a value of $273,466, showing a considerable decrease compared with recent previous months, and making a total for the first eleven months of last year of 232,490,049 pounds of a value of $4,245,054, contrasted with 254,561,096 pounds valued at $4,235,521 in the similar eleven-month period of 1936. Imports of miscellaneous paper stock, comprising old rope, scrap bagging, waste paper, etc., in November were 8,165,498 pounds valued at $170,878, bringing the total in eleven months of 1937 up to 110,987,872 pounds of a value of $2,573,268, against 93,889,210 pounds at $1,654,417 in the same time of 1936.

◆ Paper

Imports of paper and paper products into the United States amounted in value to $12,339,446 in November, compared with $9,840,130 in the same 1936 month, according to U. S. Commerce Department data. Eleven months' imports last year were valued at $124,836,415, representing a large gain over receipts of a value of $99,141,687 in the corresponding period of 1936. Standard newsprint imports in the first eleven months of 1937 reached a value of $111,357,709, against $86,948,193 in the same 1936 time.

EXPORTS

Exports of paper and paper products from the United States continued to hold up well November, shipments during that month exceeding those of the corresponding month of 1936 by 50 per cent, from a value standpoint. Indications are that the total for the calendar year 1937 reached the 1930 total of $30,000,000. Exports for the first eleven months of last year amounted to $28,348,941 in value, an increase of approximately 40 per cent over the similar period in 1936. While some of this increase can be accounted for by higher range in prices, the greater part was due to a substantial rise in the volume of shipments. Excluding boards and insulating board, wall paper and "other paper products," which are not shown by weight and which represent somewhat less than 25 per cent of the total shipments, the volume of exports during 1937 was 32.4 per cent higher than in the preceding year, while the value of the same classes increased by 43.7 per cent.

Exports of paper base stocks from the United States during 1937 made even greater progress than paper. The value of exports of this group in the first eleven months of last year reached $20,424,196, an increase of 82 per cent over the corresponding period in 1936, and closely approaching in value the amount recorded for the paper group. Exports of bleached sulphite pulp accounted for about 67 per cent of the paper stock exports, other classes of wood pulp comprising an additional 8 per cent. The remaining 25 per cent represents rags, waste paper and pulpwood. Exports of wood pulp showed a rise of 46 per cent in volume and 75 per cent in value over 1936, rags an increase of 58 per cent in volume and 105 per cent in value, and other paper stock increases of 265 and 213 per cent, respectively.

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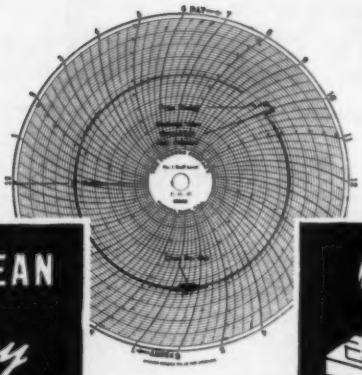

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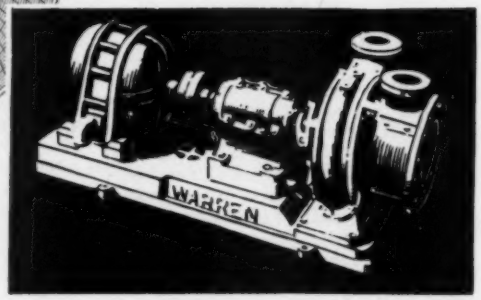

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